

MODERN

May, 1940

# Machine Shop

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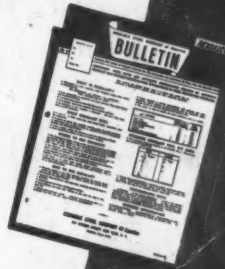
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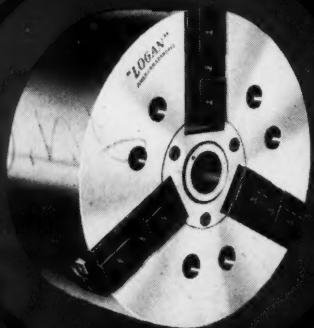
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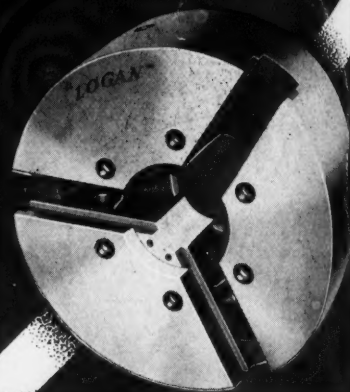
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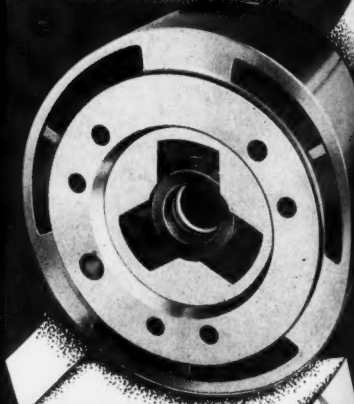
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**ONE-PIECE STEEL BODY**





# MODERN Machine Shop

HOWARD CAMPBELL, Editor

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MAY, 1940

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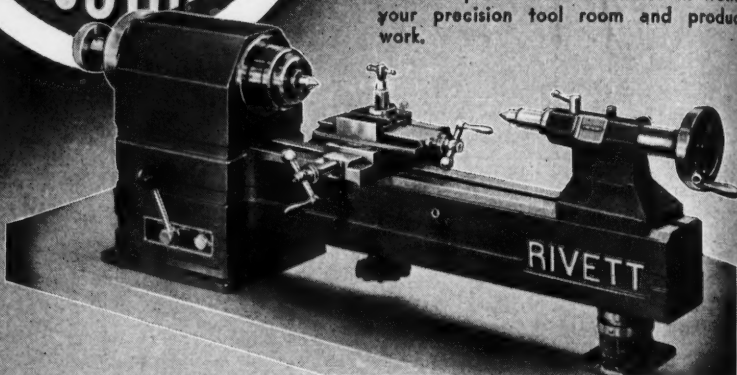
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### 918 BENCH LATHE

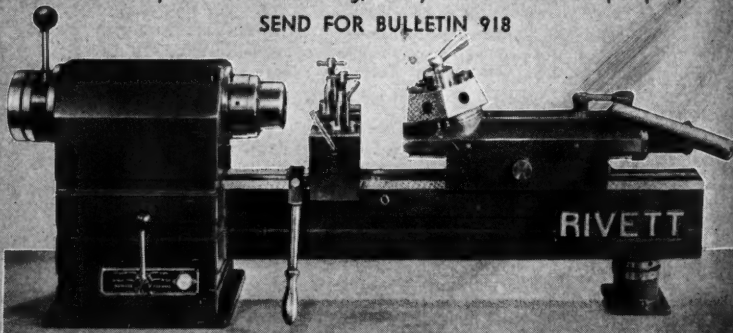
Bulletin 918 presents Rivett high precision, heavy duty bench lathe and hand screw machine. The balanced design, vibrationless performance, high spindle speeds and operating features place these machines in front for your precision tool room and production work.



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# MODERN Machine Shop

CINCINNATI, OHIO

MAY, 1940

VOL. 12, No. 12

## We Present---

—some of the more interesting operations in a typical American manufacturing plant which, in the course of sixty years, has grown from a small shop to a large, modern plant through the ability of its owners to keep step with progress and with "The American Way."

—the third article of the series "Tool Steel for the Non-Metallurgist," by H. E. Replogle. If you haven't been reading this series, you have missed something interesting and—even if you are a trained metallurgist—very much worthwhile. And Mr. Replogle knows his stuff.

—a discussion of "Vibration Problems" that will be invaluable to the manufacturer who is having vibration trouble. The author, E. H. Hull, of the General Electric Company, is one of the few who have made a close study of this subject. We think this is the best article that has been written on this subject.

—another article on the subject "Modernization of Power Drives" by Frank Gooding. The transmission and application of power is a matter that has to be settled for each machine in every new plant, or whenever a department is re-arranged, or even when a single, solitary machine is to be moved. Frank has presented some good suggestions in this article.

—a number of efficient and useful tools in the "Ideas From Readers" section, descriptions of which were sent in by the men who designed them, or by executives in the plants where the tools are in use. The editor is always glad to have descriptions and photographs or drawings of unusually good special tools, and top price is paid for these items.

The editorial program for next month's issue will include another array of fine articles, written by men who are recognized leaders in their respective fields. Neither effort nor expense is limited in the plan to give readers of this magazine the newest and best material that can be obtained on topics relating to engineering or plant management.

# Building Quality Engines at Buda

**M**ANKIND has been relieved of thousands of difficult, tedious, and laborious tasks as a result of the opportunity for the application of power that has been afforded through the development of the common type of gasoline engine and later through the perfection of the Diesel engine. The comparatively recent perfection of the Diesel in the smaller size has added the advantage of economy to that of facility.

Among the better-known of the independent producers of internal combustion engines is The Buda Company, located at Harvey, Ill. Buda engines are used in trucks, buses, tractors, various types of water

. . . . By . . . .

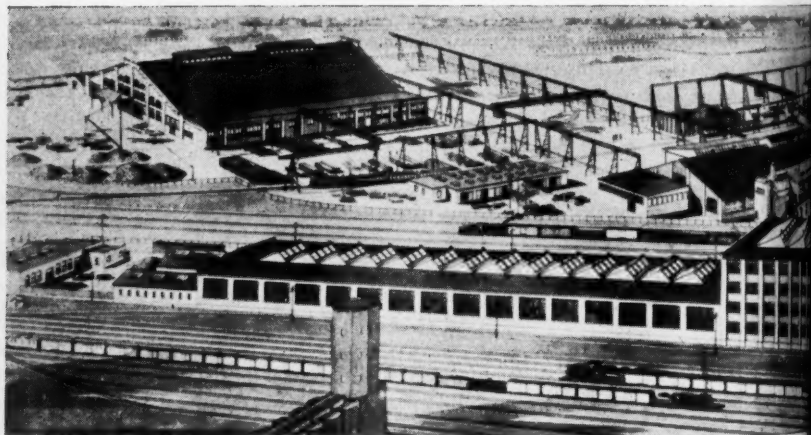
D. C. PETERSON

Plant Manager, The Buda Company, Harvey, Illinois

craft, and so on. Established in 1880, the company engaged in the manufacture of railroad supplies, in which field the company still maintains leading position. In 1910 the possibilities of rapid development of the automotive industry were recognized and a line of gas and gasoline engines was developed for use in cars, trucks and the various types of vehicles enumerated above.

In 1926 the company began to

Plant of The Buda Company, Harvey,



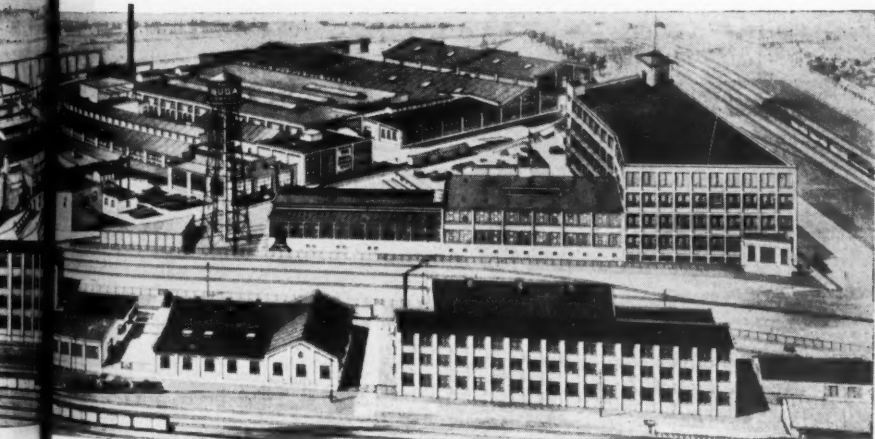
One of the oldest of American manufacturers of internal combustion engines, the Buda Company began building gas and gasoline engines in 1910 and Diesel engines in 1926. Some of the manufacturing operations on Buda engines are presented in this article.

manufacture of Diesel engines for application to industrial equipment, marine service, generating sets, and power units for a wide range of requirements, and in 1933 introduced a line of Diesels for use in trucks and buses.

The Buda Company has a splendidly-equipped plant, occupying 500,000 square feet of floor space and employing approximately 1,500 men. Each individual operation is performed in a machine and with tools that are particularly adapted for the purpose, and special equipment is employed where such equipment will reduce costs or improve the quality. Some of the operations involved in the production of Buda engines are described and illustrated here.

The first machining operation on an engine block is that of milling the bottom, top, and one side of the block. All subsequent operations locate from one of these surfaces—usually the bottom one—thus machining the three sides simultaneously is not only economical but ensures that the top and bottom surfaces will be parallel and that the side will be square with the bottom. Such an operation, in process on a Model 691 engine block, is shown in Fig. 1.

Five cutters are used on this operation; two to cover the bottom of the block, a similar rougher and finisher for the top of the block, and one cutter for the side. The first one of the two cutters on the top and bottom removes all of the stock except 1/64 in., which is left for the finishing cutter. The machine is an Ingersoll mill of recent design, of sufficiently sturdy construction so that a heavy cut can be taken on the work



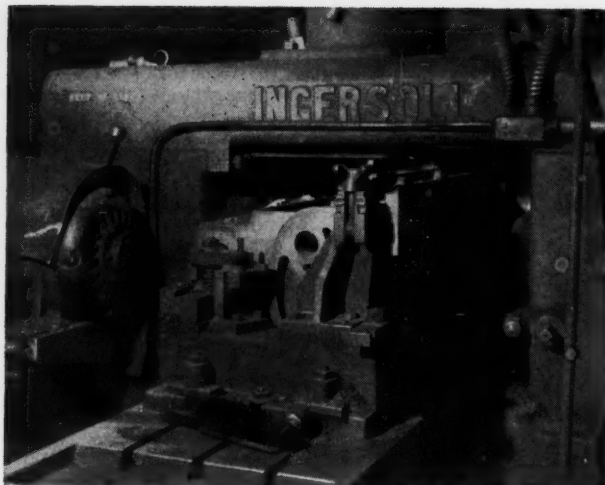


Fig. 1—Machining the top, bottom, and one side of a Buda engine block. Two cutters—rougher and finisher—are used on the top and the same on the bottom.

without loss of accuracy or finish.

The operation shown in Fig. 2 is that of drilling the main oil line hole endwise through a cylinder block. This hole is  $\frac{5}{8}$ -in. diameter and 36 in. long, necessitating the use of special drills for this extreme length. The machine is a Rockford horizontal type machine to which have been applied two hydraulic units, one at either end, to drive the drills. The hydraulic power makes possible any variation in speed and feed which may be dic-

ated by changes in the size of the drills or in hardness of the material. In the completed engine, oil is pumped through this long hole, from which it is forced to the engine bearings.

The piston holes in the engine blocks are bored in the heavy duty vertical boring machine shown in Fig. 3. This machine is equipped with six spindles, three holes in each two blocks being bored at each operation of the machine; thus a complete block is produced in each operation.

In boring these holes, which are 5-in. diameter, a center distance of 0.003 in., plus or minus, is maintained and 0.007 in. of stock is left in each hole to be removed later in the final honing operation.

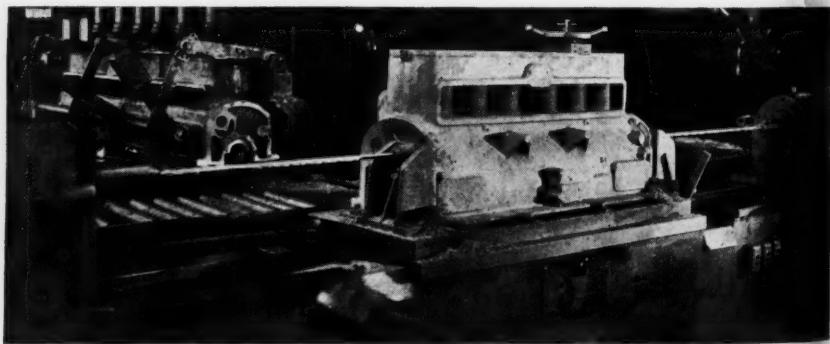


Fig. 2—Extra long drills are required for drilling the main oil line hole endwise through the cylinder block. This hole is  $\frac{5}{8}$  in. diameter and 36 in. long.



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Fig. 4—With this machine each piston hole is honed to a mirror finish and within a tolerance of 0.00075 in.

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One of the features of this operation is the quick-acting clamping mechanism. The clamps are connected by toggle joints to a shaft which extends across the front of the machine so that as the operator moves the lever in one direction or the other and thus revolves the shaft, the clamp is brought to bear on the blocks or is released accordingly. Weights help to hold the clamps in place while the operation is in progress. The clamp serves its purpose perfectly, is quickly and easily operated, and eliminates practically all of the time formerly spent in tightening down nuts on the old style clamps.



After boring, each cylinder block is passed to the Barnes vertical honing machine shown in Fig. 4, where each piston bore is individually honed. The hone carries seven stones which have been selected for this particular

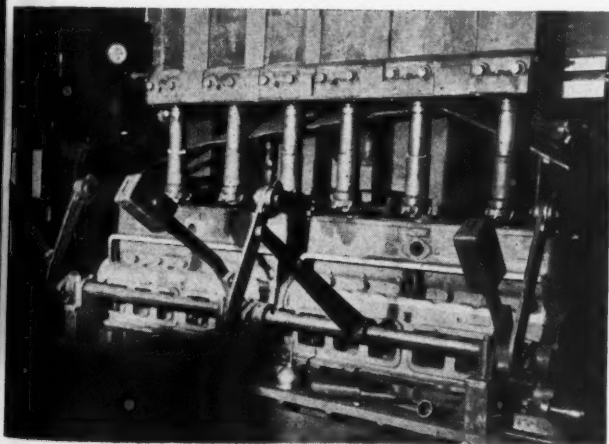


Fig. 3 — Boring the piston holes in the engine block. The quick-acting clamp is the feature of this operation.

task because of their efficiency in removing stock from cast iron while at the same time producing a mirror-like finish. Two hones are used, a roughing hone which removes approximately 0.005 in. of stock, and a finishing hone, which removes the last 0.002 in. and produces a smooth, straight, and round hole within a tolerance of 0.00075 in. The hones are flooded with kerosene while in operation to keep the hones cool and to carry off the residue.

The illustration Fig. 5 shows the operation of boring the crank and camshaft holes and idler stud hole in the crankcase for a Model 691 Diesel engine. A Baush horizontal boring machine was selected for this job due to the ease with which the tools can be set at the proper center distance and the ease with which the long boring bars can be handled in such a machine. To bore the seven bearings in this crankcase, three sets of three

boring bars each are used in which single point tools are employed to do the cutting. In the roughing cut approximately  $3/32$  in. of stock on a side, or a total of  $1/8$  in., is removed in each hole leaving  $1/32$  in. for the second cut. The second sets of bars leaves about 0.020 in. of stock for the finish reamer, which finishes the holes to size within 0.0007 in. of drawing size. When finished, the crankshaft hole is  $3\frac{1}{8}$ -in. diameter. The large size of the crankshaft bearings is indicative of the strength that is built into these engines all the way through.

Camshafts are rough turned in "Lo-Swing" lathes, one of which can be seen in operation in Fig. 6. These machines are especially built for heavy turning operations and are designed to employ a set of tools with which various part of the work can be turned simultaneously. Roller back rests are employed to prevent the

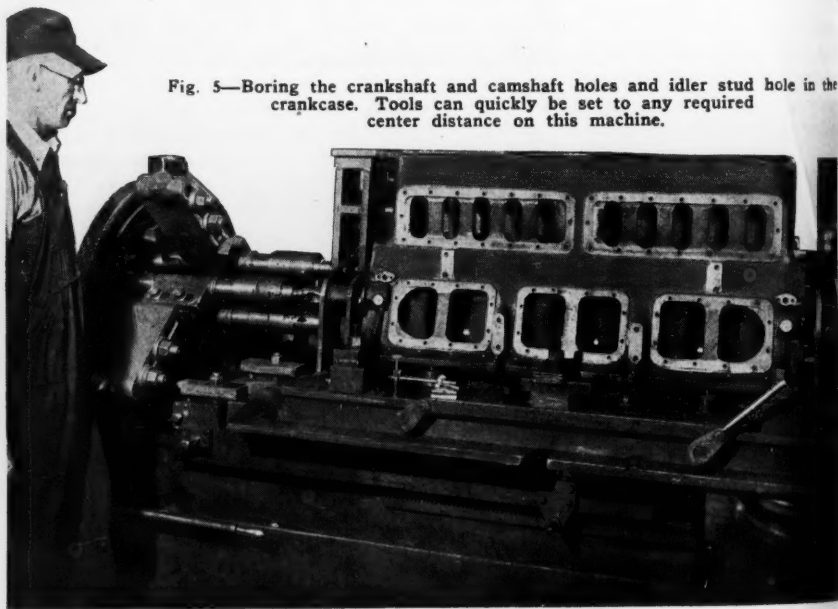
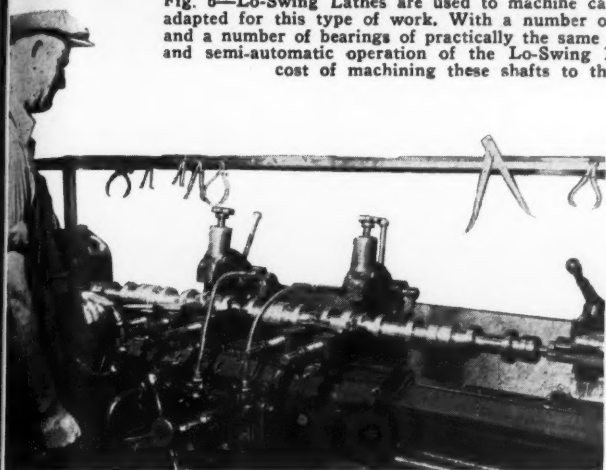


Fig. 5—Boring the crankshaft and camshaft holes and idler stud hole in the crankcase. Tools can quickly be set to any required center distance on this machine.

Fig. 6—Lo-Swing Lathes are used to machine camshafts, being especially adapted for this type of work. With a number of cams of the same size and a number of bearings of practically the same size, the multiple tooling and semi-automatic operation of the Lo-Swing Lathe cut the time and cost of machining these shafts to the minimum.



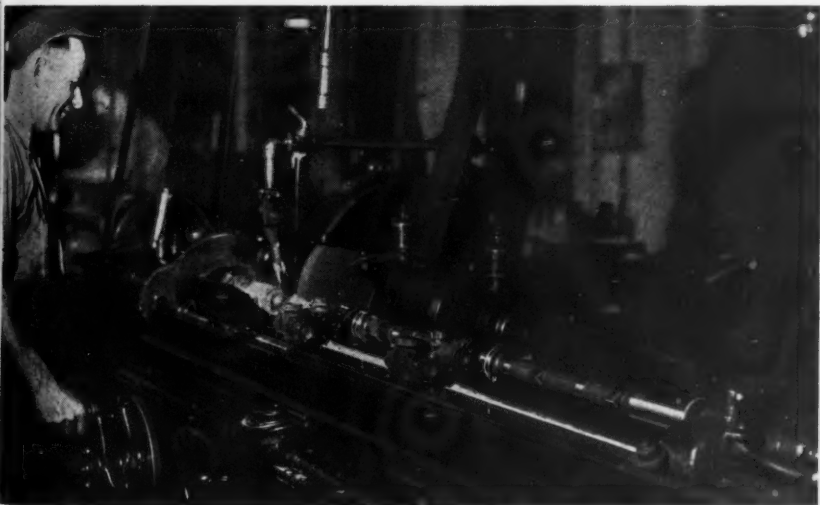
six - cylinder engines; thus each has twelve cams.

After the camshafts have been finished turned, the cams are ground to size in the Norton grinder shown in

work from deflecting or "jumping" under the pressure of the tool; thus heavy cuts can be taken with assurance of accuracy. In the instance under discussion, 3/32 in. of stock is left on the shafts for finish turning and grinding. These shafts are for

operation in Fig. 7. All of the intake cams are ground in one operation and the exhaust cams in another, a fixture being used which swings the shaft away from the grinding wheel at just exactly the right time so that the proper shape will be ground

Fig. 7—Camshaft cams are finished to the correct size and contour in this Norton grinder, the tolerance being plus or minus 0.001 in. for the cams and 0.005 in. for the bearings.



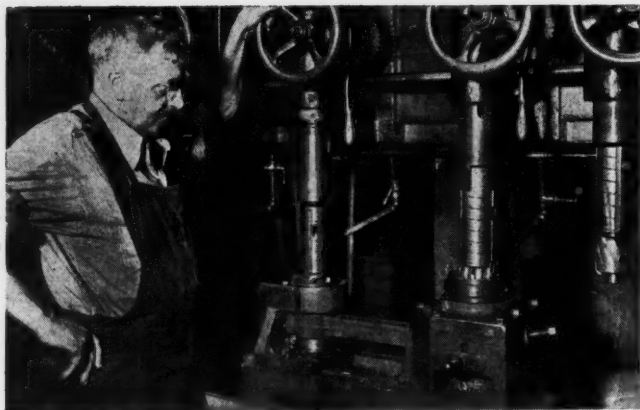


Fig. 8—A Footburt drill, equipped with special spiral reamers, is used to bore the wristpin and main bearing holes in the connecting rod for a large Diesel engine.

on the nose of the cam.

In the rough grinding operation the stock is reduced to 0.030 to 0.35 in., this amount being left for the finish grinding operation. In finish grinding, the cams are finished to shape and size within a tolerance of plus or minus 0.001 in. and the bearings are ground to size within a tolerance of 0.0005 inch.

Some of the parts for the larger models of Diesel engines are of quite heavy design. The connecting rod shown in process in Fig. 8 is 17 $\frac{3}{4}$  in. between the centers of the bearing hole and wrist pin hole. The operation shown here is that of rough

boring the rod for which a Footburt drill is used with specially designed spiral reamers. The hole in the large end of this rod is 2 $\frac{7}{8}$ -in. diameter and that in the small end is 3 $\frac{1}{2}$  inches.

In order to obtain a perfect fit two reaming operations are employed on the large end, leaving 0.012 in. to be removed in a later diamond boring operation.

The main bearing and wristpin holes in the connecting rod are finished to size in the Ex-Cell-O diamond boring machine shown in operation in Fig. 9. The center distance is maintained by the machine within a

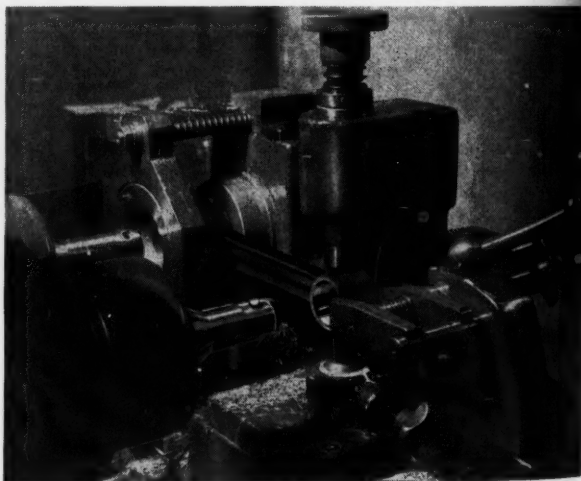


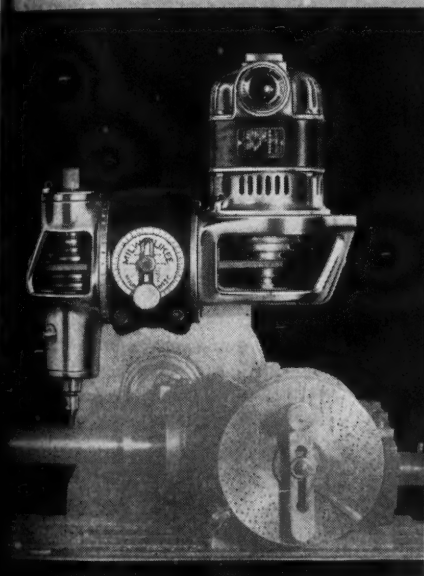
Fig. 9—The wristpin and main bearing holes in the connecting rod are finished to size in this Ex-Cell-O diamond boring machine. The tools are of Carboloy, and the diameter of the holes is held to a tolerance of 0.00025 inch.

# ANNOUNCEMENT...

The Midgetmill and Speedmill, high-speed milling attachments formerly produced and sold under the name of DALRAE by the DALRAE TOOLS CO., Syracuse, New York, are now part of the K&T Milwaukee line of modern milling machine attachments and accessories.

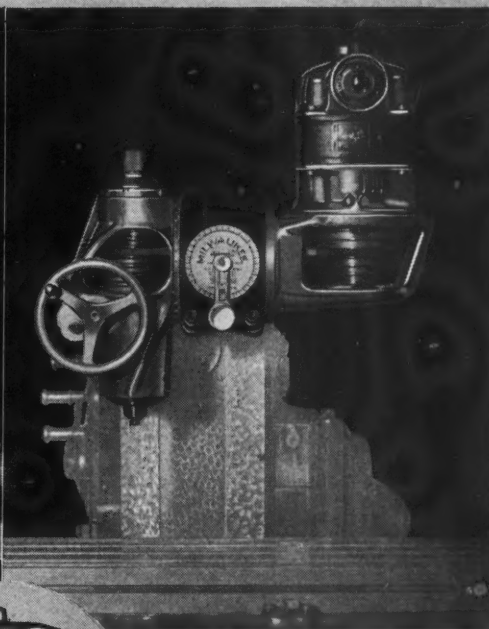
The efficient design and high quality of construction of both the Midgetmill and the Speedmill will be maintained — in keeping with the accepted and recognized K&T Milwaukee Milling Machine standards of performance and quality.

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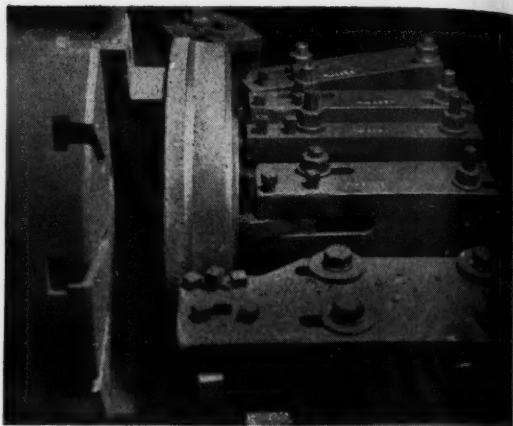
## The MIDGETMILL

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MILWAUKEE MILLING MACHINES



Fig. 11—With six tools in operation simultaneously, the Gisholt Simplimatic finishes a flywheel in minimum time.



limit of 0.002 in. Carboloy tools are used, the spindles operating at speeds of 475 r.p.m. for the large hole and 700 r.p.m. for the small hole. Removing approximately 0.012 in. of stock, the large hole is bored to 2.500 in. and the small one to 1.500 in. within a limit of plus or minus 0.00025 in. The Carboloy tools, which are practically as hard as diamonds, produce a mirror finish.

Face milling operations on the manifolds are performed in the Sundstrand Rigidmil shown in Fig. 10. Three surfaces are machined simultaneously in this operation, for which

inserted tooth cutters using Stellite blades are employed. The multiplicity of blades in each cutter produces a comparatively smooth and accurate surface in one cut. In removing  $3/32$  in. of stock on a side, the cutters operate at a feed of  $3/32$  in. per revolution and a speed of 120 ft. per minute.

Fly wheels are rough turned on a Gisholt Simplimatic, the set-up for which is shown in Fig. 11. Six tools are shown in operation simultaneously; four facing the various fls on the face of the wheel and two taking a turning out. It is obvious that with

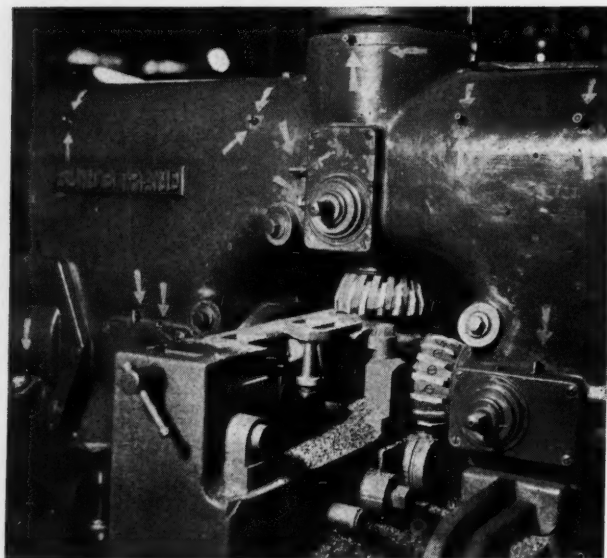


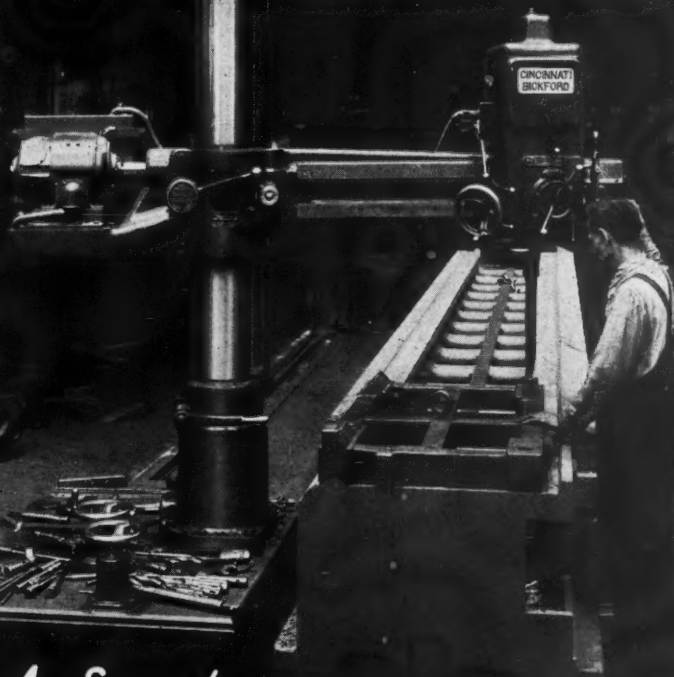
Fig. 10 — Face-milling the top and sides of a manifold, using inserted-tooth cutters.



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MODERN MACHINE SHOP

69

May, 1940



Fig. 12—Using a special fixture and an American radial drill gear housings are bored to within 0.001 in. of the specified distance between centers.

of noise, the gear housings are bored in a special fixture used in connection with the American radial drill shown in operation in Fig. 12.

In this operation are finished one  $5\frac{1}{4}$ -in. hole, one 4-in. hole, and one  $2\frac{1}{4}$ -in. clearance hole. Rough and finish reamers, each having six blades, are used in both of the large holes, the roughing tool removing all but 0.015 in. of stock which is left for the finishing reamer. In the finishing operation the 0.015 in. of stock is removed, finishing the hole to within limits of 0.0015 in. of the drawing size and within 0.001 in. of the

four tools dividing the facing operation between them and two turning tools dividing the turning operation between them, the time of roughing a flywheel can be reduced to the minimum. In the final turning operation the flywheels are finished to 12.898—13.903 inches.

Quiet operation is a highly desirable feature in an internal combustion engine and this factor of quietness depends to a large extent upon the accuracy with which the gear centers in the gear housings are machined. To ensure that the Buda engines will operate with a minimum

drawing specification for center distance between holes.

The Buda Company is representative of American industry, developing its works from a small shop to a large plant through the ability to keep pace with progress and the faculty of being able to adapt the plant and its equipment to the needs of modern civilization.

**Elephant Brand Phosphor Bronze Bushings**, product of the Central Steel & Wire Co., 4545 S. Western Blvd., Chicago, Ill., are listed in an illustrated and descriptive six-page folder released by this firm. Copy free upon request.

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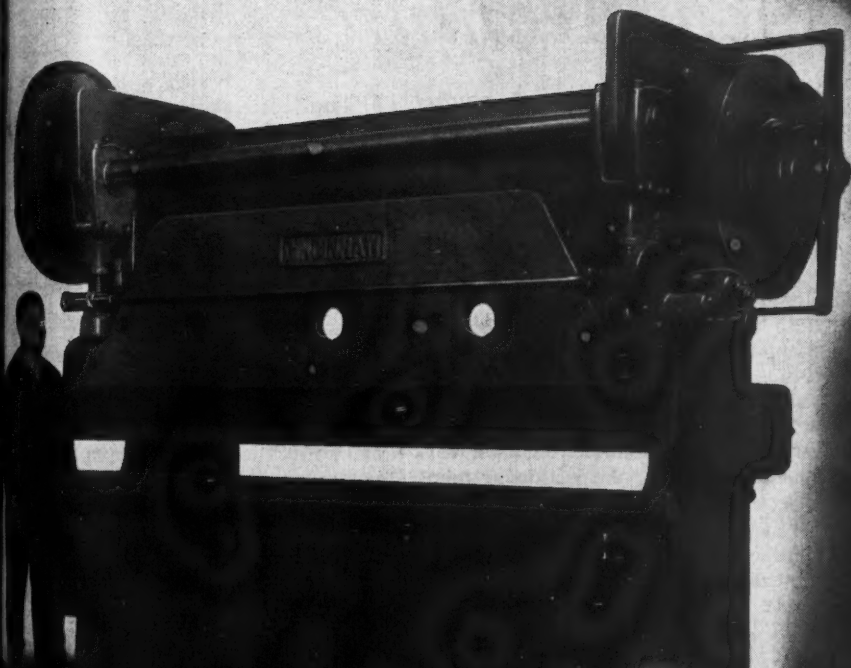
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May, 1942



The small general utility Cincinnati Press  
Brakes, like their Big Brothers, are sturdy  
and perform with the same machine  
tool accuracy . . . . .



CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

SHAPERS - SHEARS - BRAKES

RV

... By ...  
H. E. REPLOGLE  
Crucible Steel Company  
of America

# Tool Steel for the Non-Metallurgist, III

**P**ROBABLY every seasoned engineer or metal working plant executive has learned by experience that good, careful heat treating pays big dividends. They can all probably recall numerous cases where attempts to cut corners or take short cuts have resulted in spoiled work, or work which required more time to finish than would have been necessary had the job been done correctly the first time. A tool or die is actually worth only the scrap value of the metal until it has been heat treated. This fact should be remembered when work is sent into the heat treat department.

At the time it should be remembered that when the heat treater says that one job will take longer than another, or will take longer when made from a different type of tool steel, he is not merely being temperamental. He knows that just as it may take longer to machine a piece of a certain type or design, it will also take longer to correctly harden it. A glance back at the analyses of the various types of tool steels described in the previous article of this series will show why this statement is true. As a rule, the more alloy in a tool steel, the longer it will take to properly harden that steel.

Another point that should be mentioned is the advisability of providing the heat treat department with good equipment. Just as with machine tools—which have been improved

The third article of the series, in which the author gives suggestions for the heat treatment of the four basic types of tool steels.

greatly during the past few years—so have improvements been made with heat treating furnaces and temperature-controlling instruments. The question should have careful and intelligent thought. A heat treat department may be hiding potential savings which can be cashed in on with but slight investment.

## Heat Treating Carbon Tool Steels

Of the tool steels under consideration in these articles, the Carbon Steels will be found to harden at the lowest temperatures. The usual range is from 1,420 degs. F. for very thin sections, such as edge tools where maximum keenness is desired, up to about 1,475 degs. F. for large sections. With impact and shock tools such as cold header dies, silver striking dies, and so on, experience has shown that higher temperatures up to about 1,550 degs. F. are desirable. These higher quenching temperatures produce some coarsening of the structure, thus imparting greater fatigue resistance.

Preheating of all tools is desirable

and a temperature of around 1,200 degs. F. will seldom cause scaling or decarburization unless the work is left at this temperature for an excessive length of time.

The question of soaking time at the quenching temperature is a debatable one. Some authorities insist that no soaking or preheating is necessary. However, the majority of experienced heat treaters still do both, and in view of the fact that tools and dies of unequal section have to be hardened, it appears to be better judgment to veer on the side of a little extra time.

A rule frequently quoted as to the time that should be allowed for heating has been 1 in. per hour. When using this rule, however, it should be remembered that it was originally meant to apply to straight carbon tool steels at 1,400 degs. F. With the higher alloy group, heating time will be retarded at this temperature and allowances must be made for this fact.

One of the most common "headaches" of the man doing the heat treating is the so-called "soft-skin" or decarburized area that has resulted from the steel being at such a temperature and in such a furnace atmosphere that the carbon is removed from the surface of the steel. Such a condition is certainly harmful if no grinding can be done, and every step that can be taken to avoid it should be arranged for. Electric furnaces without atmospheric control are notorious for this tendency and the best way to avoid it is to pack the work in a completely inert compound, such as cast iron chips.

A word should be said here for this

method of packing. For temperatures up to about 1,850 degs. F., where atmospheric control furnaces, lead pots, or salt baths are not available, cast iron chips comprise one of the best packing mediums available. Being inert, they do not in themselves change appreciably. If high temperatures are used for a long period of time, it is



Fig. 5—"Attempts to cut corners or take short cuts have resulted in spoiled work—"

possible that a slight carburizing action may take place due to carbon pick-up from the chips. However, in no case is this pick-up serious, and it is certainly to be preferred to a carbon loss from the surface of a tool or die.

One of the chief objections to cast iron chips as a packing medium has been the fact that they will fuse to the work if high temperatures are used. An excellent method of preventing this consists in merely wrapping the work tightly with two or three



thicknesses of heavy brown wrapping paper. After the work is so wrapped, it should be placed in the container on top of a layer of chips and then completely covered to a depth of 1½ in. above the highest part of the work. Over this is spread about ½ in. of cast iron siftings, which completes the making of an excellent pack.

As to the paper; when the container is removed after heating and the work is removed from the chips for quenching or cooling, it will be found that

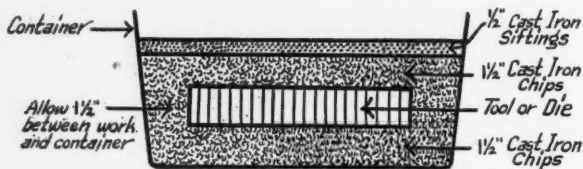


Fig. 6—Illustration Showing an Improved Method of Packing a Tool Steel Section in Cast Iron Chips for Hardening

the paper did not burn, but merely charred. Enough strength was present in this charred paper to keep the chips away from the work with the result that few, if any, chips adhered to the work. The drawing Fig. 6 illustrates a proven method of packing.

If packing in cast iron chips is impossible, the heat treater should not resort to charcoal. This probably sounds like heresy, as a great deal of excellent work has been done with this method of packing. However, experience has shown that charcoal cannot be depended upon. Under certain atmospheric and furnace conditions it seems to be completely inert; in other cases it may become a violent carburizing agent. It may actually ignite in the container and thus raise the work to a dangerous temperature, or, oddly enough, the pack may generate a gas predominately carbon dioxide, which is a violent decarburizing agent at temperatures between 1,400 degs. and 1,800 degs. Fahrenheit.

To return to the heat treatment of

Carbon Tool Steels; if a cast iron pack is not possible with a non-atmospheric controller electric furnace, it is helpful to throw wood chips or sawdust into the furnace. The wood, when burning, will use up much of the oxygen present in the furnace and thus lessen the intensity of any decarburizing action which may be taking place.

If a gas-fired or oil-fired furnace is used, some control of the atmosphere is possible. For steels hardened from a comparatively low temperature, a slightly oxidizing atmosphere should be used. This may be obtained through adjustment of fuel and air valves and a quick check on the atmosphere can be made by

throwing a small piece of wood on the furnace bottom. Fuel and air controls should be so set that the wood will burn slowly and with a soft flame. Such a description is admittedly difficult to interpret, but experiments with heating equipment will quickly illustrate the results which can be obtained through careful control of furnace atmosphere. Of course, the better the control, the better the surface condition of the work.

For Carbon Tool Steels a lead bath will, of course, assure freedom from decarburization as will the heat treating salts for a liquid bath. If lead is used, fine charcoal should be sprinkled on the top of the bath to a depth of ½ in. This will help prevent the lead from sticking to the tool or die as it is removed from the bath. There is also available a special salt which stays on the surface of the lead and gives even better results. If lead is used, all dross must be skimmed off the bath before hardening is started.



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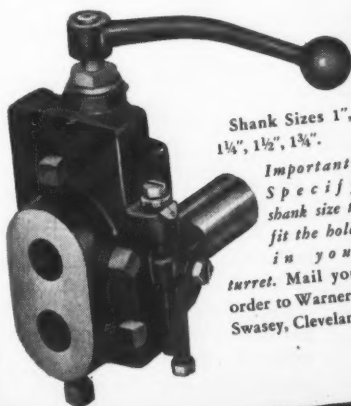
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Once the Carbon Tool Steel tool or die has been brought up to the quenching temperature, as mentioned previously, a soak at that temperature is desirable. No set rule can be made for the amount of soaking time, it being dependent entirely on the mass involved as well as the shape. For small tools, such as chisels, five

part of the cooling operation has been completed. Small tools, such as taps, drills or edge tools, should be removed immediately. For larger sections, a slight delay should be allowed before the work is taken out. For very large work, a good rule to follow is to remove it as soon as it can just be touched with the bare hands under water.

The belief that, to secure full hardness, a Carbon Tool Steel tool or die must be stone cold before removal from the quench is not borne out by the facts, and there is no advantage in following this practice. On the contrary, this practice is dangerous.

It is a well established rule that tempering of Carbon Tool Steels should be done **immediately**, and "immediately" does not mean within the next half hour or fifteen minutes. If a tempering bath or furnace is not available at the time of removing the work from the quench, such work should be placed in boiling water—not oil—and held there for at least one-half hour. Such a treatment will largely remove the quenching strains present and permit the work to be held safely until tempering can be done.

Where absolutely maximum hardness is desired, probably the lowest safe tempering temperature is that of boiling water. Except for such work as burnishing rolls, such a treatment is not often encountered. For general tool and die work, the usual tempering temperature is between 350 degs. F. and 400 degs. F. For edge tools, or tools subject to impact, such as chisels and rivet busters, a temperature of 550 degs. F. to 600 degs. F. should be used.

#### Heat Treating Oil Hardening Tool Steels

The heat treatment of oil hardening steels, previously listed in this



Fig. 7—"Fine charcoal should be sprinkled on the top of the bath—"

minutes is usually sufficient. For larger work such as punches and dies it may be advisable to soak at temperature for thirty minutes. For the general run of work these time-periods will usually be correct.

When quenching Carbon Tool Steels, either in water or brine, the work should be held in the liquid until all vibration ceases in the tongs. This is usually a signal that the most violent

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series as No. 5 and No. 6, usually requires a temperature of from 1,450 degs. F. for small work to 1,500 degs. F. for large work. It will be seen that the average hardening temperature is somewhat higher than for Carbon Steels. A longer time should also be allowed for soaking at temperature to permit the steel to become completely uniform structurally. With Steel No. 7, a High Carbon-High Chromium, soaking times of from thirty minutes to an hour at 1,750/1,800 degs. F. should be used because of the sluggish character of this grade of steel, caused by the high chromium content. Due to the higher hardening temperature and the longer soak required, all High Carbon-High Chromium tools should either be heat treated in an atmospheric-controlled furnace or salt bath, or, if these are not available, packed in cast iron chips as previously described.

In quenching, the best general rule calls for the work to be kept in the quench until it can be held in the bare hands while still submerged. Tempering should be done immediately, as with a Carbon Tool Steel. If this is impossible, the use of a boiling water bath is recommended to relieve all quenching strains.

The usual hardness required for general tool and die work is Rockwell C 60/62. Tempering at 350 degs. F. to 400 degs. F. will bring the oil hardening grades within this range.

#### **Heat Treating Air Hardening Tool Steels**

The main difference in the heat treatment of the Air Hardening Steels as compared with the Oil Hardening Steels is merely the method of cooling. The use of an atmosphere-controlled furnace or salt bath or packing in cast iron chips is important if the best surface conditions are desired. With open furnace hardening

of Oil Hardening Steels, at the time of the quench any scale which may have started to form on small areas will be thrown off or so loosened as to permit easy cleaning. If the steel is cooled in air, this action is not complete, with the result that tools may have a tight, abrasive scale, difficult to remove.

A good rule to observe with Air Hardening Steels which are being cooled from the hardening temperature is: do not attempt to temper them until they can be held in the bare hands, but temper them as soon as they can be held. If this rule is followed, there will be very little chance of tempering them before full hardness has developed or of tempering them after dangerous strains have started.

#### **Heat Treating High Speed Steels**

The heat treatment of High Speed Steels is generally considered more exacting and as requiring more skill than other types of tool steels. However, if proper equipment is available, the correct procedure can be learned in a short time.

Due to the high temperatures necessary in order to secure maximum cutting efficiency—2,100/2,200 degs. F. for molybdenum types, and 2,300/2,400 degs. F. for tungsten and tungsten-cobalt types—there is always a chance of harming the tool or of actually burning it if the furnace temperature and atmosphere are not closely controlled. For shops which have gas or oil furnaces that will produce the required temperature, but which have no special equipment with which to produce a proper atmosphere, there are several ways in which High Speed Steel tools can be hardened with the maximum protection.

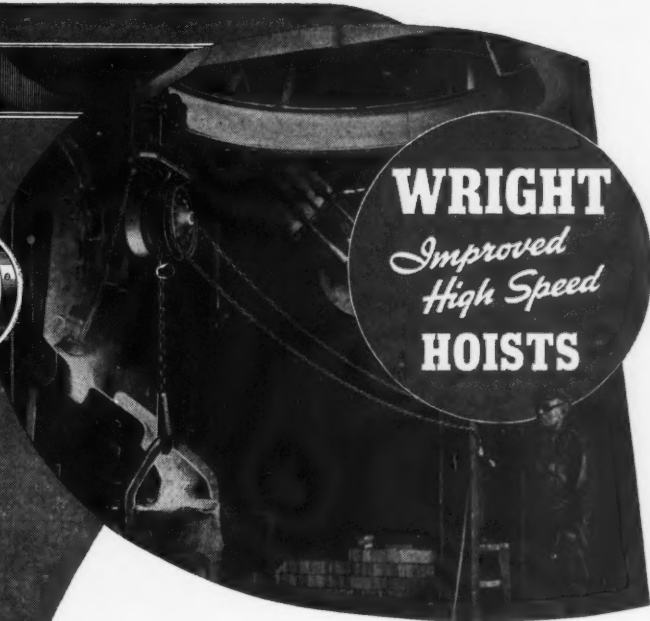
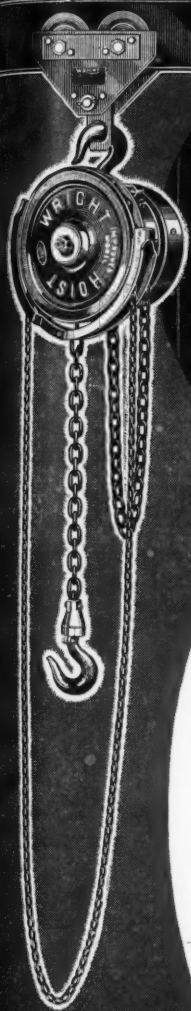
First of all, with these types of furnaces the air and fuel lines should be

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so adjusted as to provide a "reducing" atmosphere in the hearth. This term simply means that the volume of air is cut down until there is an insufficient amount for complete combustion. With this done, the tools can be coated with one of the three different compounds with which varying degrees of protection are obtained.

Borax is used in the first method presented. The tools are brought up to a preheating temperature of 1,500 to 1,600 degs. F., then they are removed from the furnace, sprinkled all over with dry borax, and returned to the preheating furnace. When the borax has melted and flowed over all of the surface to be protected, the tools are transferred to the high temperature furnace. At the time of transfer the tools should have a glassy appearance, with no unmelted borax present.

Shortly after the transfer to the high temperature furnace it will be observed that bubbles and blisters begin to form, caused by the action of the heat on the borax coating. The body of the tool should be carefully watched and when it is up to heat it should be held at this heat for about a minute (less for small tools) and removed for quenching.

A second method in which borax is also used consists in making up a super-saturated solution by pouring dry borax into hot water until no more will dissolve, heating the tools to approximately 400 deg. F. and then plunging them into the solution, removing them immediately. The dry borax will be deposited uniformly, the heat of the tool driving off all moisture. For a thicker coat, this same procedure can be repeated. If this is done, however, one should be sure to remove the tool immediately from the solution to prevent the first deposit from being washed off. After this has been done the tool is dipped into the

borax solution, then transferred to the preheating furnace, followed by the procedure used previously.

It is important to note here that borax is very destructive to certain types of furnace hearths. If the method outlined above is used, the hearth must be protected with sheet asbestos, a fire brick, or a metal tray.

Pitting is apt to take place at temperatures above 2,300 degs. F. Also there is no assurance that complete protection is possible after the steel has reached this temperature.

Another method of protection consists in the use of water glass, of the kind sold in grocery stores for preserving eggs. To use, the tool is coated by dipping it into a solution of two parts of water to one part of water glass, then transferring the tool to the preheating furnace. When the tool is up to the proper preheating temperature, it is transferred to the high temperature furnace. It will be noted that the coating does not flake off at the preheat temperature. In cases where pitting occurs with cobalt or molybdenum steels, it can usually be prevented by the use of water glass.

Sel-Car can also be used for protection. This product is a compound available commercially, with which the tool is painted cold. After the compound has dried, the regular preheating and high heat cycle is followed.

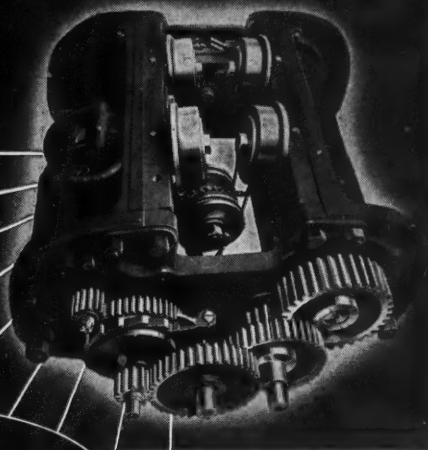
It should be noted that when either water glass or Sel-car is used, hearth protection is not absolutely necessary as these materials have no destructive action.

Once a tool has been heat treated by any of the methods described above, it is necessary to remove the coating. Probably the best method for any one of the three methods is by the use of a fine steel grit blast; in fact, this method is the only one that

(Continued on page 110)



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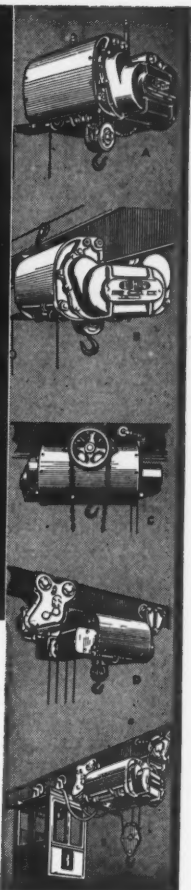


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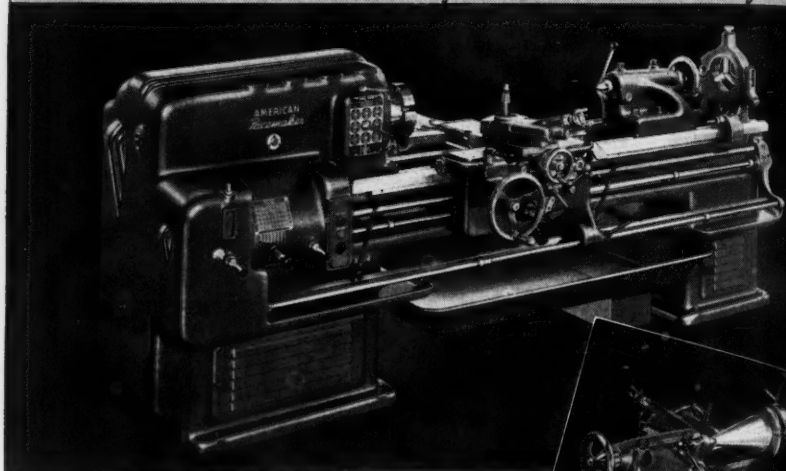
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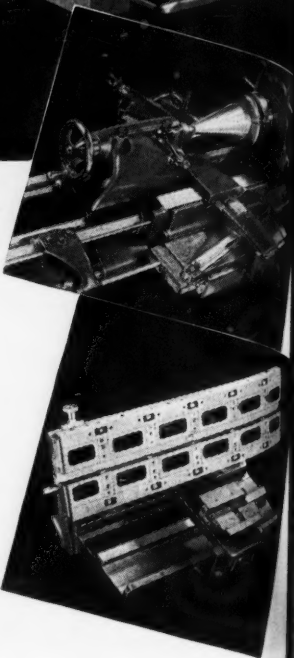
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# Vibration Problems

... By ...  
E. H. HULL  
General Electric Co.  
Schenectady, N. Y.

TO most of us mechanical vibration is a nuisance; annoying, and sometimes destructive. I envy those few men who make practical use of it in the design of vibrating screens, compacting devices, and in reducing bearing friction.

Before we discuss specific vibration problems, it might be well to review the situation in regard to measuring instruments. A sinusoidal vibration can be represented by

Displacement =  $x = A \sin \omega t$ , or  $A$   
for max. value

Velocity =  $v = \frac{dx}{dt} = A\omega \cos \omega t$ , or  
 $A\omega$  for max. value

Acceleration =  $a = \frac{d^2x}{dt^2} = -A\omega^2$   
 $\sin \omega t$ , or  $A\omega^2$  for max. value

By measuring any two of the four quantities — displacement, velocity, acceleration, and frequency, the other two may be obtained. Normally we measure frequency and one of the other three, depending on the frequency range in which the work is being done.

For large displacement, low frequency vibrations, displacement is usually measured. Readings are made in mils (1 mil = .001 in.) total dis-

A general discussion of practical vibration problems, presented before the Cincinnati Chapter of the American Society for Metals\*

placement or 2A.

The medium range small displacement vibrations can best be measured in terms of vibration velocity in mils/sec. Vibration velocity gives relatively greater weight to higher frequency vibration, since it is proportional to  $A\omega$  and therefore is more nearly equivalent to one's physiological reactions to vibration.

Very small displacement, high frequency vibrations (above 1,000 cps) are usually measured as acceleration or  $A\omega^2$ . The frequency squared term makes this type of measurement very sensitive to high frequencies.

There are many types of instruments for making these measurements. I will mention only those which we use most often.

Frequency can be measured with Frahm tuned reed vibration tachometers in the range from 450 to 24,000 vpm.

Displacement has been measured with a wide variety of instruments more or less accurate. We use an optical lever, light beam indicator which will follow large displacements at high frequency.

Vibration velocity measurements are made with an electrical pickup shown schematically in Fig. 1. The voltage output of the coil moved by vibrating body is proportional to the rate of cutting lines of permanent

(\*Reported exclusively for MODERN MACHINE SHOP.)

magnet flux or to its velocity. Inertia holds the permanent magnet field stationary in space. These instru-

screen. Simple electrical integrating or differentiating circuits can be applied to any of the electrical vibration pick-ups to make their output proportional to displacement, velocity, or acceleration as desired.

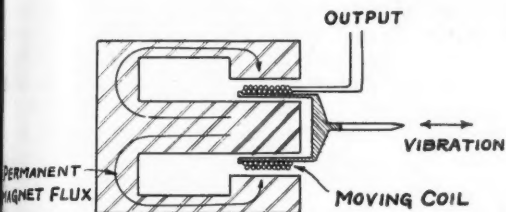


Fig. 1—Elements of a Vibration Velocity Pick-Up

ments are used in connection with an amplifier and cathode ray oscillograph or other measuring device as indicated in Fig. 2.

horizontal plates of the tubes. By connecting the vibration wave to be investigated to the vertical plates this

Vibration acceleration measurements can be made with a piezo electric crystal type pick-up in which the vibrational motion, imparted to the portion of the crystal, produces stresses in the crystal propor-

tional to the inertia reaction of the mass of the crystal, giving a Piezo electric output proportional to acceleration. This type of pick-up can be substituted for the velocity pick-up in the apparatus of the mechanism illustrated in, Fig. 2. With this combination, using a single stage amplifier and an eighty-dollar oscillograph, a vibration of  $\frac{1}{4}$  of a millionth of an inch (0.00000025 in.) at 1,200 cps will produce a  $\frac{1}{2}$ -in. amplitude wave on the cathode ray tube

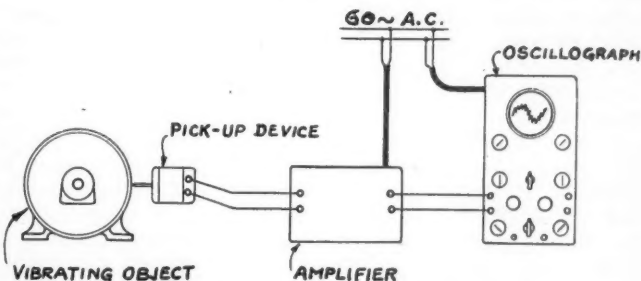


Fig. 2—Use of Cathode Ray Oscillograph with Vibration Pick-Up

wave may be made to remain stationary on the tube screen, providing the vibration repeats itself periodically.

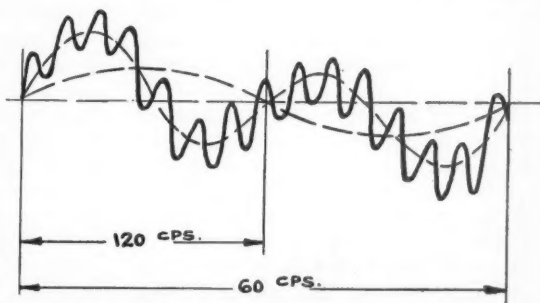


Fig. 3—Vibration Wave with Three Components



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Displacement =  $x = A \sin \omega t$ , or  $A$   
for max. value

Velocity =  $v = \frac{dx}{dt} = A\omega \cos \omega t$ , or  
 $A\omega$  for max. value

Acceleration =  $a = \frac{d^2x}{dt^2} = -A\omega^2 \sin \omega t$ , or  $A\omega^2$  for max. value

By measuring any two of the four quantities — displacement, velocity, acceleration, and frequency, the other two may be obtained. Normally we measure frequency and one of the other three, depending on the frequency range in which the work is being done.

For large displacement, low frequency vibrations, displacement is usually measured. Readings are made in mils (1 mil = .001 in.) total dis-

(\*Reported exclusively for MODERN MACHINE SHOP.)

A general discussion of practical vibration problems, presented before the Cincinnati Chapter of the American Society for Metals\*

placement or 2A.

The medium range, small displacement vibrations can best be measured in terms of vibration velocity in mils/sec. Vibration velocity gives relatively greater weight to higher frequency vibration, since it is proportional to  $A\omega$  and therefore is more nearly equivalent to one's physiological reactions to vibration.

Very small displacement, high frequency vibrations (above 1,000 cps) are usually measured as acceleration or  $A\omega^2$ . The frequency squared term makes this type of measurement very sensitive to high frequencies.

There are many types of instruments for making these measurements. I will mention only those which we use most often.

Frequency can be measured with Frahm tuned reed vibration tachometers in the range from 450 to 24,000 vpm.

Displacement has been measured with a wide variety of instruments, more or less accurate. We use an optical lever, light beam indicator which will follow large displacements at high frequency.

Vibration velocity measurements are made with an electrical pickup shown schematically in Fig. 1. The voltage output of the coil moved by a vibrating body is proportional to its rate of cutting lines of permanent

magnet flux or to its velocity. Inertia holds the permanent magnet field stationary in space. These instru-

screen. Simple electrical integrating or differentiating circuits can be applied to any of the electrical vibration pick-ups to make their output proportional to displacement, velocity, or acceleration as desired.

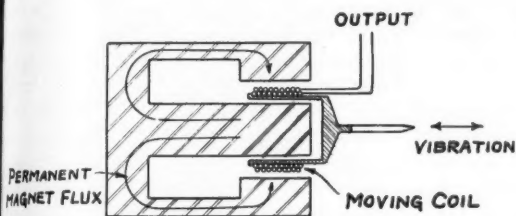


Fig. 1—Elements of a Vibration Velocity Pick-Up

ments are used in connection with an amplifier and cathode ray oscillograph or other measuring device as indicated in Fig. 2.

The apparatus shown in Fig. 2 can be made to tell us quite a bit about a vibration. Oscillographs of this type are supplied with a built-in timing wave which can be applied to horizontal plates of the tubes. By connecting the vibration wave to be investigated to the vertical plates this

Vibration acceleration measurements can be made with a Piezo electric crystal type pick-up in which the vibrational motion, imparted to one portion of the crystal, produces stresses in the crystal proportional to the inertia reaction of the rest of the crystal, giving a Piezo electric output proportional to acceleration. This type of pick-up can be substituted for the velocity pick-up in the apparatus of the mechanism illustrated in Fig. 2.

With this combination, using a single stage amplifier and an eighty-dollar oscillograph, a vibration of  $\frac{1}{4}$  of a millionth of an inch (0.00000025 in.) at 1,200 cps will produce a  $\frac{1}{2}$ -in. amplitude wave on the cathode ray tube

wave may be made to remain stationary on the tube screen, providing the vibration repeats itself periodically.

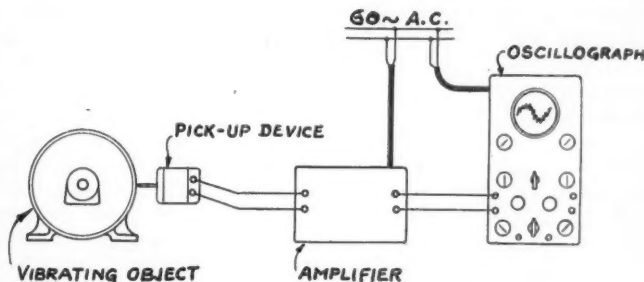


Fig. 2—Use of Cathode Ray Oscillograph with Vibration Pick-Up

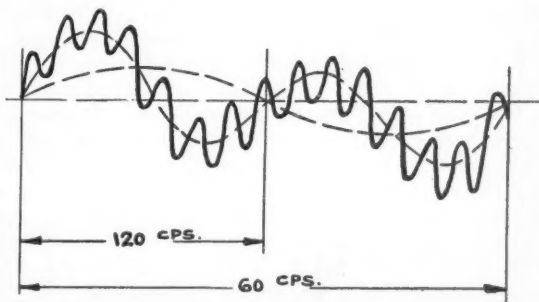


Fig. 3—Vibration Wave with Three Components

By calibrating the dials controlling the timing wave for frequency, the frequency of a vibration wave may be measured.

Furthermore, if the vibration wave is complex the frequency and approximate amplitude of several of its components may be determined. Fig. 3 shows such a wave as it might appear on the tube screen. Here we have a 60 cps wave with 120 and 900 cps components superimposed. We have been able to separate and measure five components in this way.

We can now apply these instruments in diagnosing a practical vibration problem. Let us assume a rather complicated mechanical structure such as a large machine tool with several motors driving different parts at various speeds. We will further assume that this machine vibrates too much to do the work for which it is intended.

If we set up the appropriate vibration measuring instruments on this machine; a velocity pick-up, amplifier and oscillograph, we will probably find that the vibration pattern of the entire machine when running is far too complicated to analyze. The next step is to shut down all parts of the machine under study and look for vibration disturbances coming from outside sources. These must be eliminated by elastically supporting the machine under study or eliminating the sources of disturbance before proceeding with the work of correcting vibration conditions in the machine itself.

We can simplify the problem of curing the vibration troubles within this machine by running one part at a time, beginning with the principal driving motor. Belts or other driving connections should be removed so that only this motor is in operation.

On running only the motor we will see a reasonably simple vibration

wave shape since only those disturbances due to unbalance, magnetic and bearing forces will be present. The frequency and behavior of each component will give a clue to its origin. For instance, cutting the power to the motor will remove all magnetic disturbances. Mechanical unbalance will be equal in the relation of frequency to the motor speed. Ball bearing roughness will probably occur at no particular periodicity, but will be high in frequency and will persist as the motor coasts down in speed.

If, in running this driving motor, it appears too rough, the trouble must be tracked down and cured before passing on to the next portion of the machine. Perhaps the motor will need balancing, or new bearings, or is too rough magnetically. In each case an attempt should be made to cure the trouble at the source. If that fails, an elastic support can probably be provided to isolate the motor vibration from the rest of the machine.

Resonances should be watched for at all times. Perhaps this hypothetical driving motor is quite rough at a frequency of once per revolution at full speed but at a slightly lower speed its operation is satisfactory. In that case the possibility of resonance between the motor unbalance and some portion of the machine structure should be investigated. In this case the resonant condition, rather than the motor unbalance, should be corrected.

Having obtained satisfactory operation of the driving motor, and having familiarized ourselves with the appearance of its wave pattern, we can add the next link in the machine drive. The same observations and corrections are repeated, being careful not to run added portions of the machine before the operation of those parts which are already running is satisfactory.

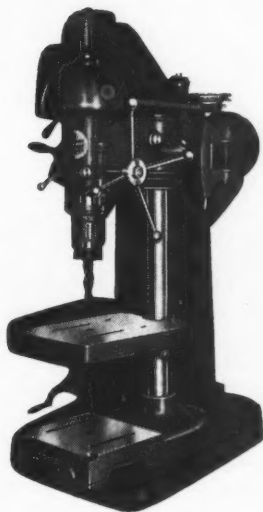
If this technique is continued until all



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portions of the machine are running, the final result should be satisfactory.

We have mentioned above several specific difficulties and cures. Elaboration of these might prove helpful.

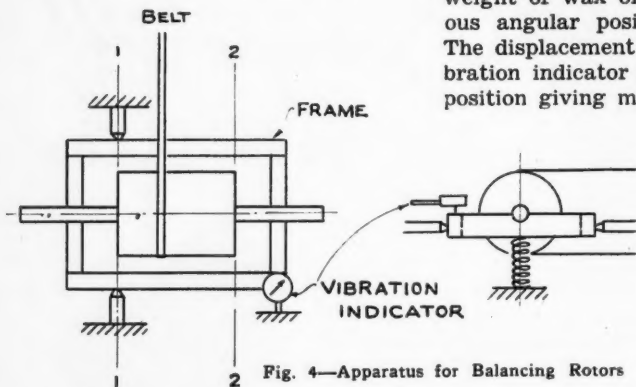


Fig. 4—Apparatus for Balancing Rotors

Unbalance is probably the most prevalent source of vibration in machines. Any rigid rotor can be balanced by the following method. A simple wooden rectangular frame, such as that indicated in Fig. 4, is built into which the rotor will fit with the shaft bearing surfaces resting in half-round bearings cut out of the end cross pieces. If the shaft is supplied with ball bearings it must be run in those bearings, the outer races being supported in V notches in the frame cross pieces.

Since a minimum of two weights, each in a different radial plane, are necessary to balance a rotor, these two planes, 1-1 and 2-2, are chosen in convenient locations on the rotor to be balanced. The frame is then supported on pivots in one of these

planes, say 1-1, while the frame is held horizontally by a spring under the other end. A light belt drives the rotor from a motor not shown.

The rotor is now run with a trial weight of wax or plasticine in various angular positions in plane 2-2. The displacement is noted on the vibration indicator for each run. That position giving minimum vibration is

found and the trial weight varied in amount until zero vibration is obtained.

After correcting the rotor as indicated by the trial weight and rerunning to verify the results, the

pivots are shifted to plane 2-2 and the process is repeated with the trial weight in plane 1-1. This balancing method is very sensitive because of the small inertia of the balancing

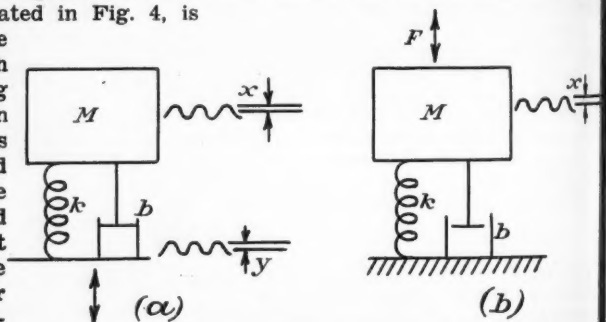


Fig. 5—Two Simple Elastic Support Systems

frame. Greater sensitivity can be obtained by doing the balancing at a speed which produces resonance of the frame and rotor on the supporting spring.

Balancing can also be done on any one of a number of standard ma-

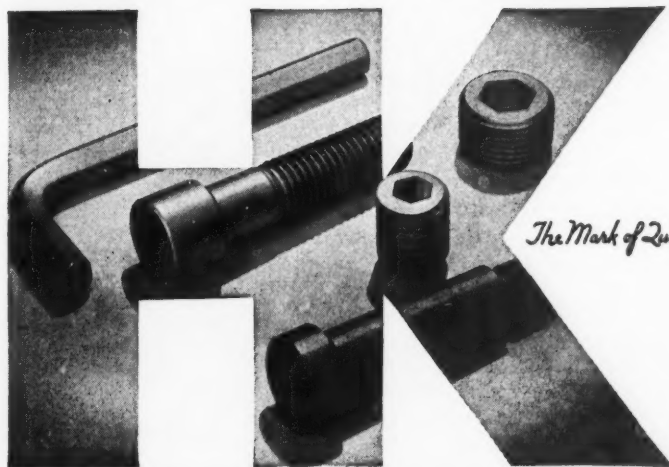


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chines. In all cases it must be remembered that the balance is good for rigid rotors only, unless the operation is carried out at the running speed of the rotor.

One of the most interesting balancing developments is a portable apparatus, weighing only 22 lb., with which any rotor of fair size can be balanced at running speed in its own bearings.

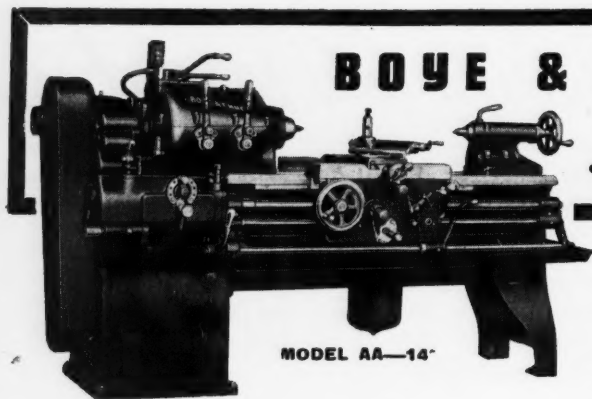
Elastic supports are useful for isolating troublesome vibration which can be eliminated in no other convenient way. Fig. 5 shows two simple elastic support systems, one in which a mass such as a delicate instrument or machine is to be isolated from an outside source of vibration and the other in which a surrounding structure such as a building is isolated from the vibration of a mass. The same expression covers

both cases. Neglecting damping

$$\epsilon = \frac{1}{\left(\frac{\omega}{\omega_c}\right)^2 - 1}$$

where the transmissibility of the system  $\epsilon$  is defined as the ratio of the disturbance getting through the mounting to the impressed disturbance.  $\omega$  is the frequency of the vibration to be isolated and  $\omega_c$  is the natural frequency of the mass on its elastic mounting.

The curve marked  $\delta = 0$  in Fig. 6 shows a plot of this relationship. It should be noted that unless the impressed frequency is greater than 1.4 times the natural frequency, the mounting is not useful. The usual tendency in making elastic supports is toward too little elasticity. This puts the mounting in the frequency ratio



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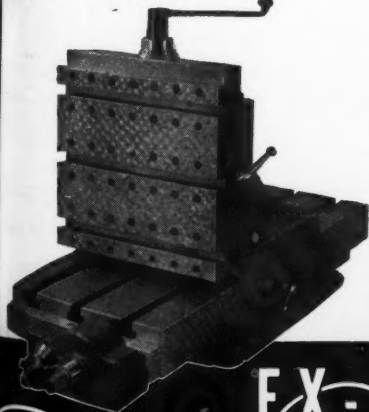
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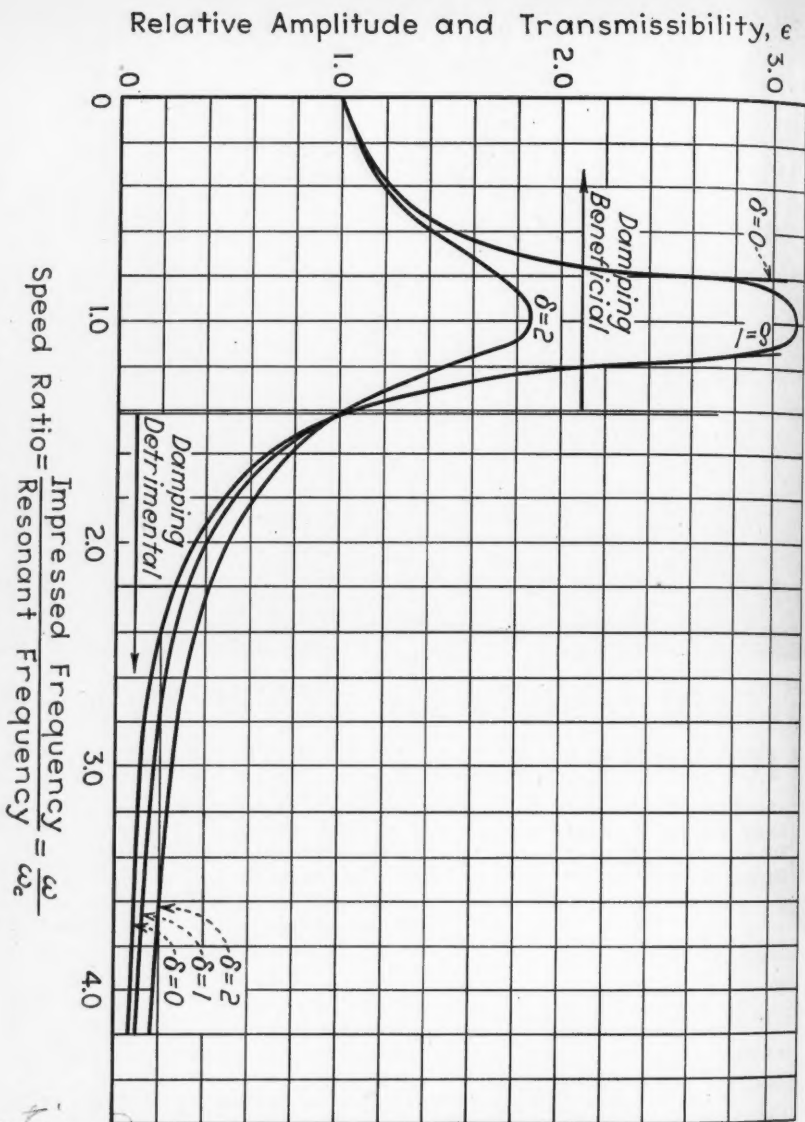
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mentioned  
range below 1.41 where an elastic support actually increases the transmitted vibration. Many elastic mounting die in this stage.

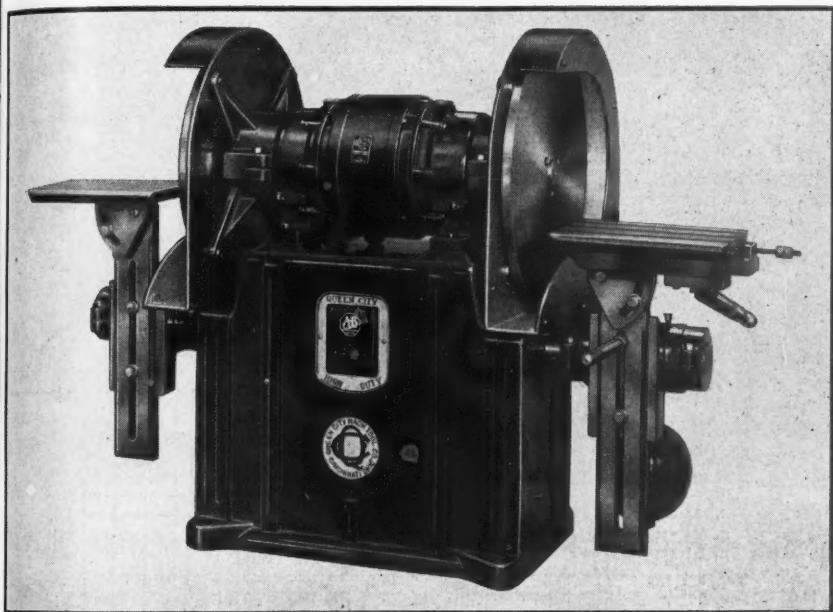
Damping raises the transmissibility

in the useful range as indicated in Fig. 6 by the curves  $\delta = 1$  and  $\delta = 2$ . The test results plotted in Fig. 7 show the effect the small amount of damping in rubber has in increasing the

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transmissibility. The solid curve represents the theoretical values for no damping, while the circles are test results for a rubber mounting. With a frequency ratio of 10, less than 2

freedom and hence six natural frequencies. Fig. 8 shows the mounting of a motor-compressor set with a concrete base on four rubber pads in compression. This set will have six

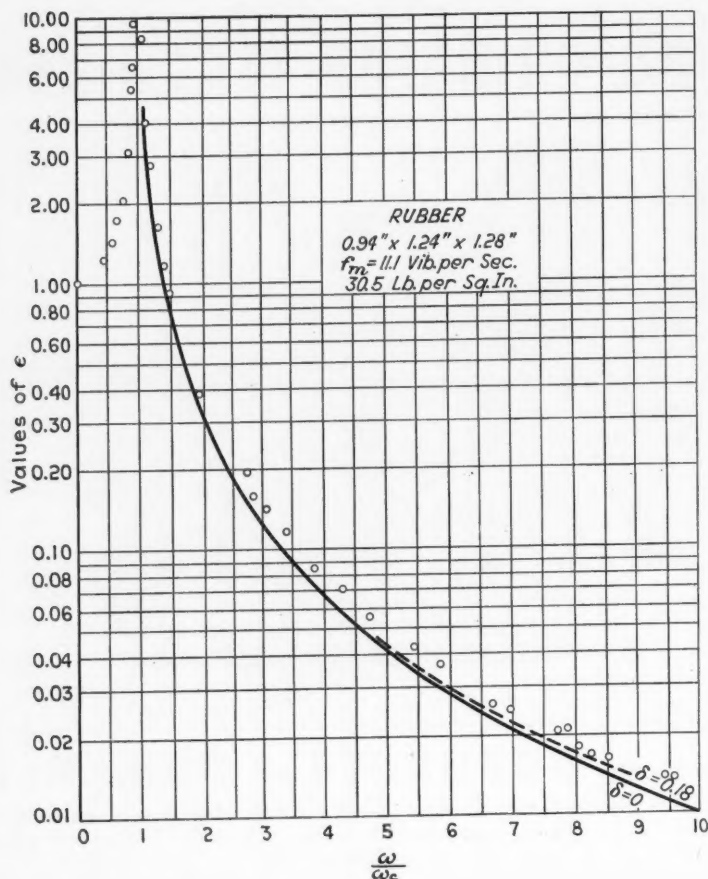


Fig. 7—Transmissibility of a Rubber Mounting (Circles) Compared with Calculated Values for No Damping (Solid Line)

per cent of the impressed disturbance gets through this mounting.

This simple theory is for a one-degree-of-freedom system. Most practical mountings show six degrees of

natural frequencies, two about each of the three principal axes. These six frequencies are  $\omega_1$  along the y-y axis,  $\omega_2$  torsionally about the same axis,  $\omega_3$  and  $\omega_4$  torsionally about two

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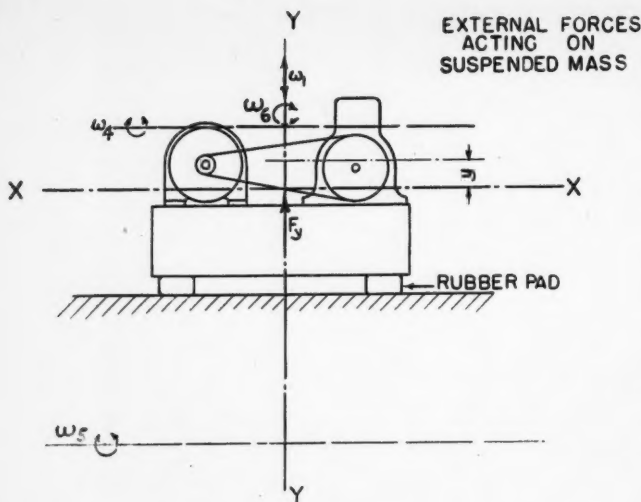
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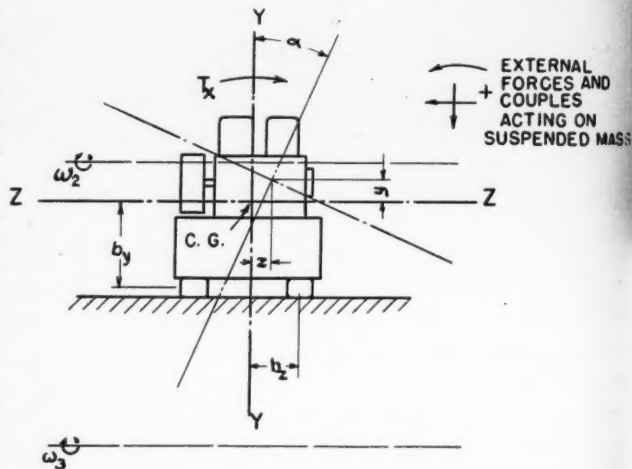


(Above) Fig. 8 and (below) Fig. 9—Modes of Vibration of an Electrically-Mounted Mass

axes parallel to the x-x axis, and, in Fig. 9,  $\omega_2$  and  $\omega_3$  torsionally about two axes parallel to the z-z axis.

In designing a mounting of this type, resonance between impressed frequencies and the natural frequencies of the system must be avoided and the natural frequencies must be made sufficiently low to provide the required isolation. These natural frequencies can be calculated from the expressions of Fig. 10 where

$\omega_1-6$  = the designated natural frequencies



set used in air conditioning. In this case the principal impressed frequencies are 29 cps due to motor unbalance, 120 cps and harmonics from magnetic disturbances in the motor, 4 cps caused by compressor unbalance, and 16 cps

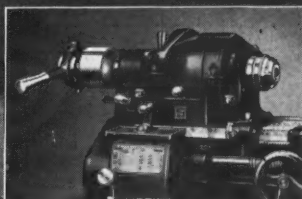
$k_x$  = total horizontal stiffness of the mounting  
 $k_y$  = total vertical stiffness of the mounting  
 $b_x, y, z$  = distances defining the positions of the supports  
 $I_x, y, z$  = moments of inertia of the suspended mass about its three principal axes  
 $M$  = mass of the suspended system

In Fig. 11 is shown the calculated natural frequencies and the test results for a motor compressor

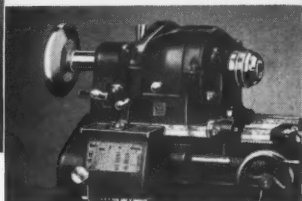
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$$\omega_1 = \pm \sqrt{\frac{K_y}{M}}$$

$$\omega_2 = \pm \sqrt{A \pm \sqrt{A^2 - \frac{K_y K_s b_x^2}{I_x M}}}$$

$$\text{WHERE } A = \frac{K_s}{2M} + \frac{K_y b_x^2 + K_s b_y^2}{2I_x}$$

$$\omega_4 = \pm \sqrt{B \pm \sqrt{B^2 \pm \sqrt{B^2 - \frac{K_y K_s b_z^2}{I_x M}}}}$$

$$\text{WHERE } B = \frac{K_s}{2M} + \frac{K_y b_z^2 + K_s b_y^2}{2I_x}$$

$$\omega_6 = \pm \sqrt{\frac{K_s (b_x^2 + b_z^2)}{I_y}}$$

Fig. 10—Expressions for Calculating the Six Natural Frequencies of a Mass on its Elastic Mounting

due to the pulsating torque requirements of the 4 cylinder compressor. There are no coincidences between the calculated values for natural frequency and these four impressed frequencies. The test frequencies for this mounting are reasonably close to the calculated values. In measuring the resonant frequency  $\omega_1$  it was noted

| WEIGHT - 1330 LBS  |            |            |            |            |            |            |
|--|------------|------------|------------|------------|------------|------------|
| PAD SIZE - 1" x 2 1/4" x 2 1/8"  |            |            |            |            |            |            |
| $K_y = 13000 \frac{\text{LBS}}{\text{IN}}$ $K_s = 1470 \frac{\text{LBS}}{\text{IN}}$ |            |            |            |            |            |            |
| MODE   | $\omega_1$ | $\omega_2$ | $\omega_3$ | $\omega_4$ | $\omega_5$ | $\omega_6$ |
| CALC. C.P.S.   | 9.78       | 13.12      | 3.28       | 8.33       | 2.94       | 5.32       |
| TEST C.P.S.  | 8.67       | 12.74      | 3.03       | 9.75       | 2.90       | 4.67       |
| d IN.  |            | -85        | 1360       | -2.4       | 62.9       |            |

Fig. 11—Comparison of Calculated and Test Results for an Elastically-Mounted Motor-Compressor Set Similar to That Sketched in Figs. 8 and 9

that the rather weak floor on which this set was mounted moved somewhat, thereby lowering this test value.

In the case of motors driving other apparatus through belts, elastic mountings can be made for the motor alone that will take belt pull and motor torque, although it is preferable to mount both the motor and driven member on the same elastically-mounted base.

Another and more unusual use for elastic supports is in changing the frequency of troublesome resonances. A small, vertical, high speed motor (see Fig. 12) carrying a bobbin on its shaft extension is used in large num-

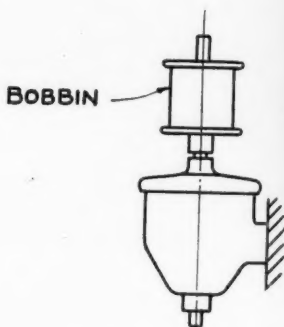


Fig. 12—A Small Vertical High Speed Motor Used in the Textile Industry to Which an Elastic Mounting was Applied to Change the Value of the Shaft Critical Speed

bers in one branch of the textile industry. When run at 10,200 r.p.m., these motors pounded out their upper ball bearings. A speed vs. shaft displacement curve, Fig. 13A, showed that these motors were running very close to the first shaft critical speed. Fig. 13b shows a sketch of a simplified equivalent system having the same resonant speed as the motor shaft. Our problem is to change the shaft critical speed of 10,000 motors at minimum expense. The solution turned out to be the use of an elas-



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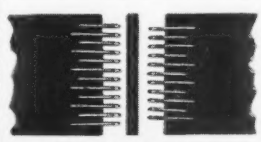
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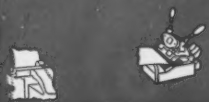
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BELT LACING

EQUIPMENT

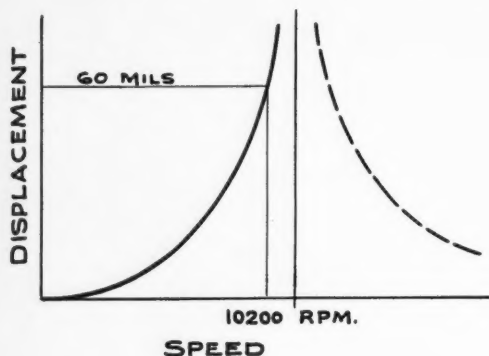


tic support to the motor.

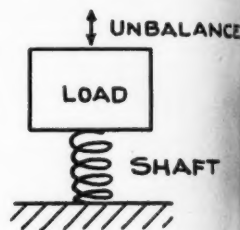
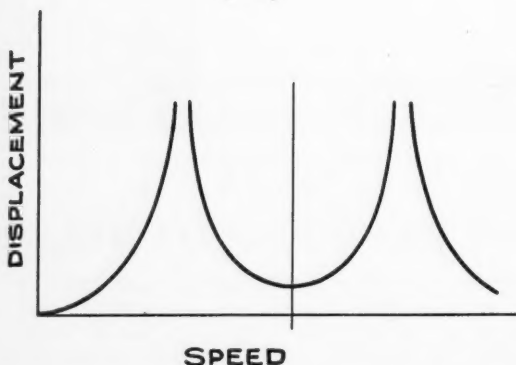
If an elastic mounting is put between this motor and the machine frame as indicated in Fig. 14, we will have two resonant speeds in our sim-

provided lower bearing pressures than would have existed with a rigid shaft and mounting, and also reduced the noise level of the machines.

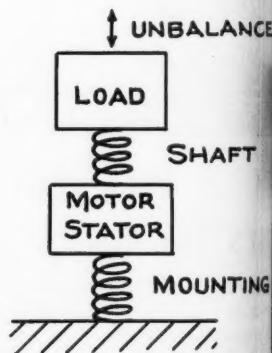
Previous mention has been made of



(a)



(b)



Figs. 13 and 14—Resonance Curves for One and Two Degree of Freedom Systems as Applied to the Textile Motor Problem

plified system; one above and one below the original single resonance. This mounting was made by squeezing an annular metal ring fastened to the motor between two rubber rings supported from the machine frame.

In addition to solving the immediate problem, the elastic mounting

vibrational disturbances due to ball bearings. This type of bearing has many advantages in the design of compact modern mechanisms. However, in the case of machines sensitive to small vibrations, even devices as precise as ball bearings may be the source of vibration difficulties. These troubles may be caused by the

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following disturbances arising in the ball bearings:

1. Eccentricity of the inner race.
2. Bump at a frequency of one per ball passing a point on the stationary race.
3. Small displacement, high frequency disturbances due to dirt and roughness of balls, races and cages.

#### Point 1

If a ball bearing mounted rotor is carefully balanced in its bearings and then the bearing inner races are turned on the shaft, the rotor may be put out of balance. Since the inner race eccentricity may amount to one mil for medium sized bearings, the resulting unbalance can be quite serious. In the case of one line of motors, the resulting unbalance could be four to ten times that allowed in the manufacturing balance operation.

#### Point 2

Since the individual balls and the races of an assembled bearing are elastic, there will be a small change in deflection under load as each ball passes the point of its maximum loading. This effect is too small to notice except when some adjacent machine part is tuned to resonate at the frequency of this impulse. A 100 KW motor generator set supplied throughout with ball bearings showed definite resonance of a bearing housing on its supporting brackets at a frequency equal to the rate of balls passing under the shaft. Substituting a ball bearing with a different number of balls cured the difficulty.

#### Point 3

The small displacement, high frequency disturbances arising in ball bearings can be detected by pressing one's finger nail on the housing of

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such a bearing while it is running. These disturbances consist of steep wave front impulses of random periodicity, and as such are capable of causing noise or exciting resonance in neighboring machine parts.

In the laboratory we set up a shaft in journal bearings driven by a 1,200 r.p.m. motor set on the far side of sound-proof partition. On this shaft was mounted a ball bearing with a free outer race; that, is the outer race could revolve at shaft speed. Stopping the rotation of the outer race with one's fingers increased the noise level of the apparatus  $1\frac{1}{2}$  to 6 db.,

depending on whether or not the outer race was cramped. Thus the addition of this bearing raised the

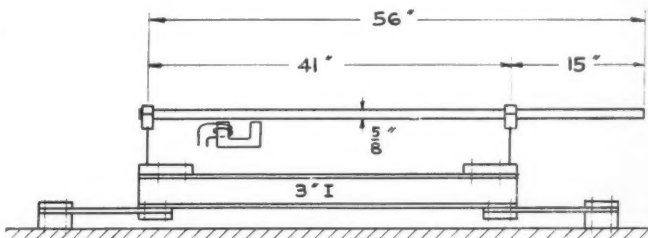


Fig. 15—Apparatus Used in the Study of Shaft and Base Critical Speeds and Modes of Vibration

sound energy given off by this apparatus by as much as four times.

In another experiment two well-balanced, 3-phase,  $7\frac{1}{2}$  h.p., 3,600 r.p.m. motors were compared. These motors were identical except that one was equipped with ball bearings and

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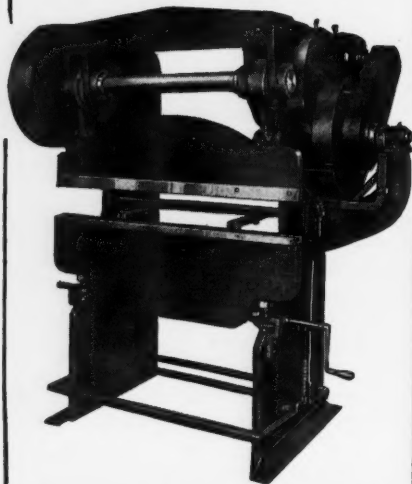
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the other with sleeve bearings. Vibration readings of frequencies above 1,000 c.p.s. taken at numerous points on these motors were up to ten times as great for the ball bearing motor. This effect was particularly noticeable on the bearing housings.

When the power was cut on the ball bearings motor, an 1,100 c.p.s. vibration persisted as the motor coasted to a stop. This vibration was shown to be due to a motor frame resonance excited by the steep wave front impulses from the ball bearings.

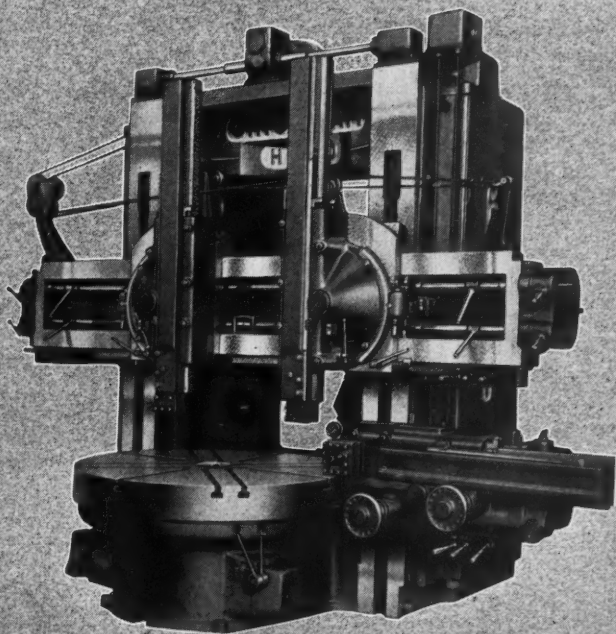
Most of us do not make sufficient use of models in solving mechanical problems. Recently I have been quite enthusiastic about shaft critical speeds and modes of vibration as determined from non-rotating models. The work started from an interest in the critical speeds of large 3,600 r.p.m. turbo-alternators. A dynamically similar model of one of these machines appears to predict satisfactorily the critical speeds of its prototype which are too difficult to calculate.

A further study of simpler models is proving interesting. The apparatus shown in Fig. 15 consists of a uniform rod clamped in the equivalent of self-aligning bearings supported on an I-beam base. This base is in turn supported by flat steel springs of variable stiffness. Excitation of the rod or base is produced by an electro magnet supplied from a source of variable frequency A.C. power.

The rod represents a machine rotor, the I-beam the machine base, and the flat springs the foundation elasticity. Various combinations of mechanical unbalance or magnetic forces can be represented by magnetic excitation of the model.

Fig. 16 shows the variation of the six lowest critical speeds of the model with foundation stiffness. Increasing stiffness of the mounting springs is





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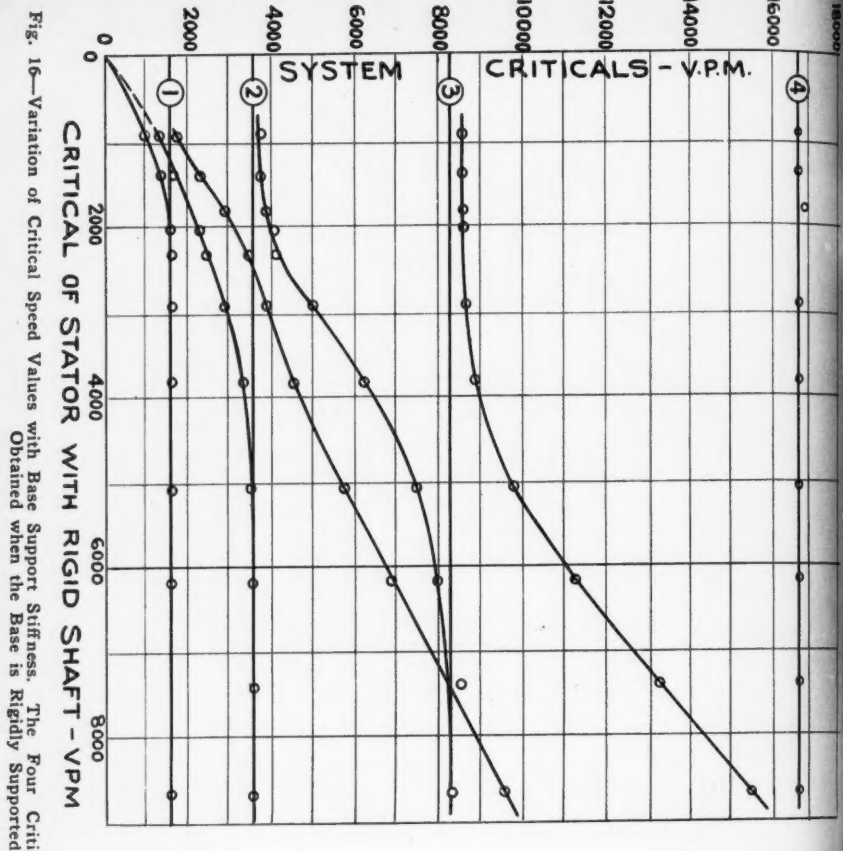
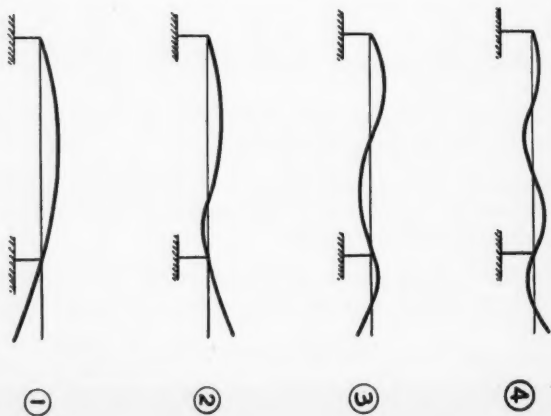


Fig. 16—Variation of Critical Speed Values with Base Support Stiffness. The Four Critical Speed Modes Shown on the Right are Obtained when the Base is Rigidly Supported



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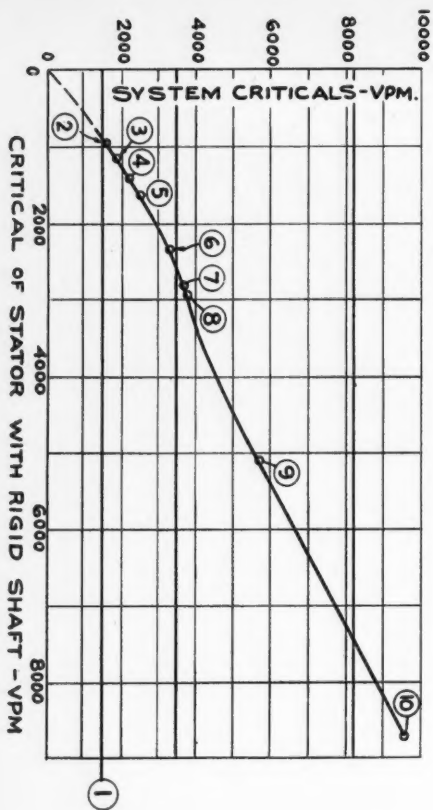


Fig. 17—Variation in form of vibration for one of the modes shown in Fig. 16. In the sketches the solid line indicates the shape of the shaft in one extreme position while the dashed lines indicate the mode of vibration of the base.



10



9



8



7



5



4



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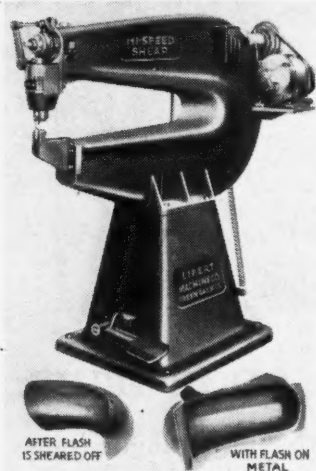
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plotted on the abscissa starting with zero stiffness at the origin. The ordinates are the frequencies at which the model showed resonance. When the model base was rigidly clamped, four natural frequencies were found, represented by the horizontal lines labelled (1) to (4). The modes for these resonances are shown in the sketches.

Figure 17 is a replot on the same coordinates of one of the model resonances with sketches of its several modes. The only variable in this experiment is the stiffness under the base. It is difficult to imagine that the form of resonance shown in sketch (10) is a development of that in (4) unless the change is seen step by step.

### Tool Steel for the Non-Metallurgist

(Continued from page 80)

will clean tools which have been coated with water glass. If the steel grit blast method is impossible, tools coated with borax or Sel-Car can be cleaned by boiling in acetic acid. However, cleaning the tools by this method should not be attempted until after the tools have been tempered. If the tools are of cobalt-bearing or molybdenum high speed steels, a high temperature salt bath, atmosphere-controlled furnace, or surface protection is imperative.

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# MODERNIZATION of POWER DRIVES, III

*Mountings for Individual Drives . . . Group Drives . . . Steel  
Superstructures . . . Ceiling Inserts . . . Reinforcing  
Structures in Old Buildings*

By FRANK E. GOODING

IN order for a machine to operate economically and satisfactorily, it must be equipped with the proper drive. Further, the drive must also be given careful attention in installation and maintenance. Failure or inefficient operation of the drive has a direct bearing upon the output of the machine. Generally, cost of ordinary repairs or maintenance is a mere trifle in comparison with the expense of an idle machine and interference with production.

Except for small, individually driven machines, drive costs are relatively a small percentage of the total machine costs. Roughly, drive costs may be compared to the cost of a belt or suspenders in comparison with the total cost of a suit of clothes; a small but essential part of the outfit and on the reliability of which much depends.

Many plant executives consider power drives as a logical point to begin shaving costs in the false belief that thereby they are saving money. This is a fallacy, although

costs of power drives may be kept low by careful selection, installation and maintenance of the most suitable type of drive.

Since power drives are often purchased separate from the machines to be driven, the cost of the drives is thereby emphasized. A plant manager will often pay a considerable sum for a machine and then look for other opportunities to economize. The power drive is, however, a poor place to start. A few dollars saved on the price of the drive may result in the loss of many hundreds of dollars in lost time, lowered production, delayed deliveries, and extra maintenance.

## Individual Drives

Cost of installation depends to a large extent upon the type of machine drive selected and method of installation. For individually driven machines, motors are mounted on the floor, overhead or on the machine. Of these, floor mounting is generally least expensive as motors do not need

to be lifted or necessitate the construction of special motor mountings. However, a floor mounting takes up floor space, in addition to which the motor is more subjected to dirt, dust, spilled liquids, and possible damage by trucks or falling objects. Also, floor mounting gives a short center drive which with flat belts may require the use of a pivoted motor base to maintain proper belt tension.

Because of exposure, floor-mounted open motors often require more frequent cleaning and repairs. Use of enclosed motors entails additional cost. Floor mountings permit use of belt, chain or V-belt short center drives. An advantage is easy accessibility in inspection, cleaning, oiling, or servicing and maintenance.

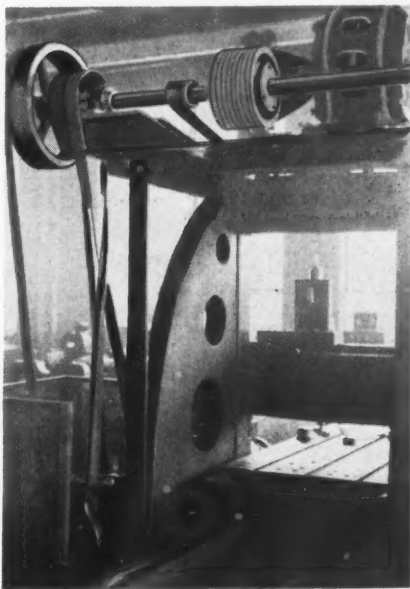
### Mounting Overhead

Mounting motors overhead, when connected by open belt drives, is probably the most common method used in metal working plants. The overhead mounting is more expensive than floor mounting in that a mounting, platform or other means of overhead attachment, plus the labor of lifting and holding while installing, are necessary. Use of pivoted motor bases to maintain tension is recommended.

Overhead mounting of individual motors has little, if any, advantage over group drive and has the same objections of vertical belts and obstruction of light. In addition, cost is considerably higher because of extra expense for individual motors, control, wiring, and installation. Also, each motor and control require periodic inspection and servicing, the cost of which is higher for overhead individual drives, as compared to group drives, because of the larger number of drives and the increased difficulty of access to each.

### Machine-Mounted

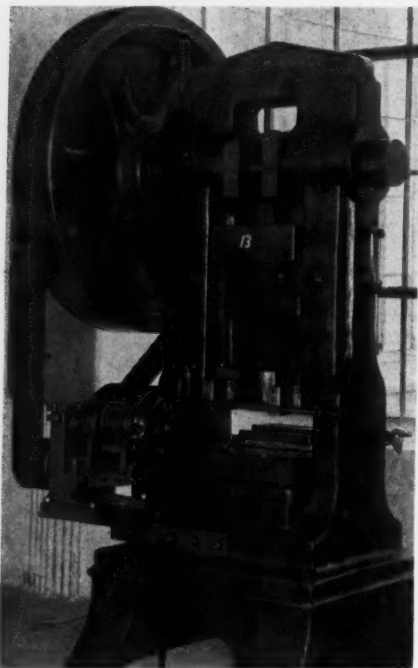
Where individual motor drives are used, the tendency is, wherever possible, to mount both motor and control on the machine. The advantage of mounting on the machine is that it makes possible the use of a short center drive by flat belt, V-belt, silent



Individual motor drive was adapted to this planer by adding a platform to the machine frame.

chain, or gear. The machine, motor and control thus comprise a unit, which facilitates shifting machines to new locations by reducing the amount and labor for rewiring and connecting up. The control may permanently be attached to the machine at the point most convenient to the operator. The entire power drive is easily accessible for repairs, inspection, servicing or maintenance and is less susceptible to dirt than when located on the floor.

Where a new machine is to be installed with individual motor drive, the most satisfactory purchase is with drive and control built into the machine. Purchasing the complete unit results in better design and appearance than when the drive is pur-



Punch press with special pivoted base mounting motor and gear reducer. This drive is manufactured as standard equipment for stamping presses.

(Photo courtesy Cullman Wheel Company.)

chased separately and attached by the user. The extra expense of providing a built-in individual drive is included in the list price of the machine, which ordinarily is quoted "less motor."

Until a few years ago a plant engineer was required to design and construct his own motor support, brackets or adaptors for machine

when changing from open belt drive to machine-mounted individual motor drive. At first these supports consisted of cast iron brackets or were constructed of structural shape and bolted or riveted together. These makeshifts were heavy, often unsightly, and in many cases not well adapted for operating convenience. Today, where such adaptors are necessary, welded construction permits building a better appearing, less expensive and more substantial attachment.

### Standardized Mountings

Some manufacturers have designed special bracket adaptors, either to fit machines of their own manufacture or a specialties for general sale. A number of good adaptors are available in the market. For attaching to lathes, for example, such an adaptor will usually consist of a cast iron bracket supporting a motor base, designed to be attached with cap screws to the lathe bed. The motor sets above the lathe and drives down. Designs are available to fit almost any standard machine tools. Illustrated is a pivoted mounting for motors and reduction gear on a punch press drive.

Due to the economy of quantity manufacturing, the cost of the commercial adaptor is comparable to that of the home-made adaptor. Improved appearance, stability and ease of installation are worthwhile advantages. These mountings would be more widely used if greater planning and attention were given earlier to the drive. In too many cases the drive receives little consideration until the engineer is practically ready to make the change. A welder is then called in and given a hurry-up order to build a mounting. Seldom is such a mounting designed on the drafting board.

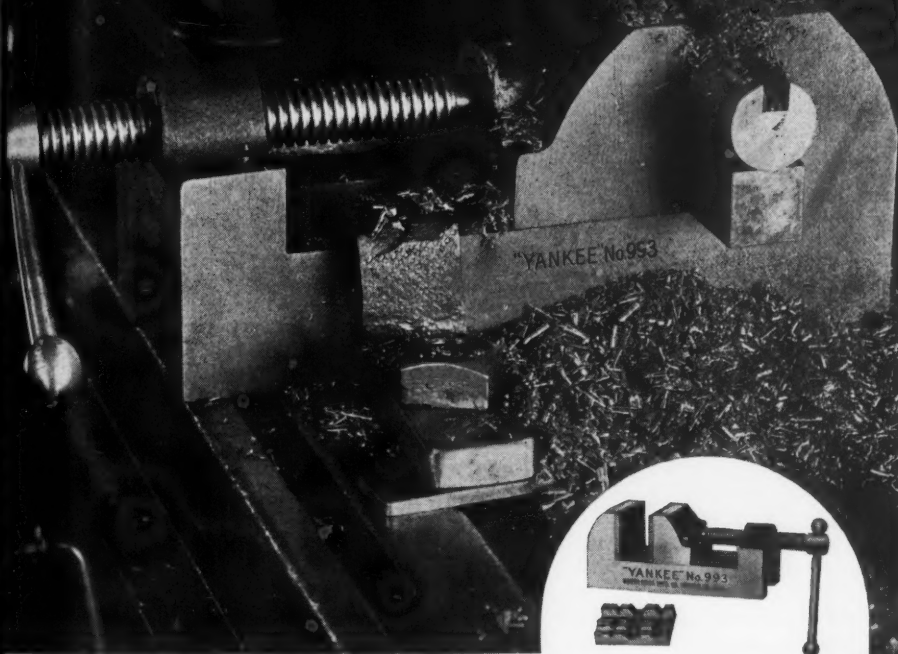
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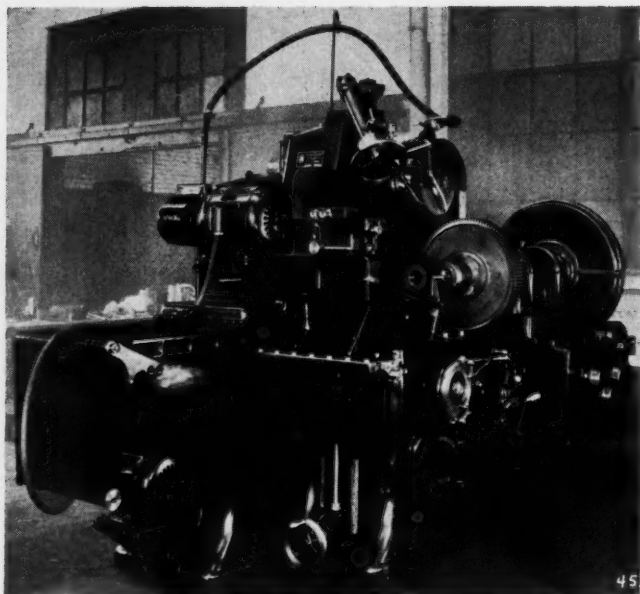
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Better appearance and efficiency are obtained when the motor drive is designed as part of the machine, as on this grinding machine. (Photo courtesy Gae Grindling Machine Company.)

On flat belt, short center drives, quick and easy means of adjusting the belt tension is necessary. Pivoted motor bases designed to provide automatic maintenance of proper tension during fluctuations in loads are recommended for these drives. The extra cost is less than might ordinarily be believed, as the pivoted base supplants an adjustable motor base and make its purchase unnecessary. In some sizes and types of pivoted bases, savings on the costs of adjust-

ture in manner which will be rigid enough to maintain alignment of the shafting under load. One of the most difficult situations is found where a lineshaft is erected in an old multi-story building of mill construction where the floor above is subjected to moving and variable loads, such as trucking and temporary floor storage of loaded and empty trucks.

Because of the ease of cutting and fitting planks and beams, wooden superstructure had been most com-

able motor bases equal approximately half the cost of the pivoted bases.

Where a group drive is to be installed, the overhead building construction must be substantial enough to permit attachment of the superstructure

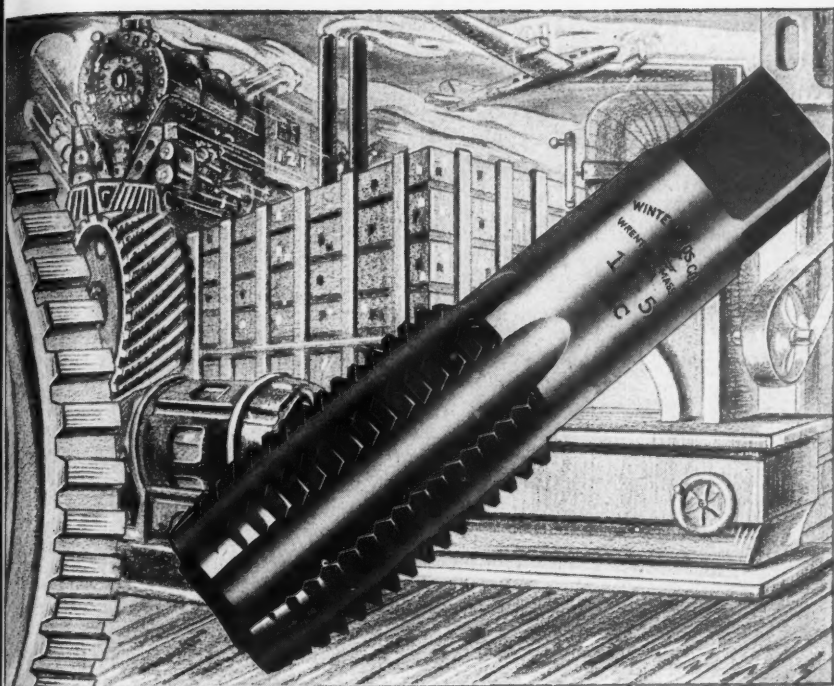


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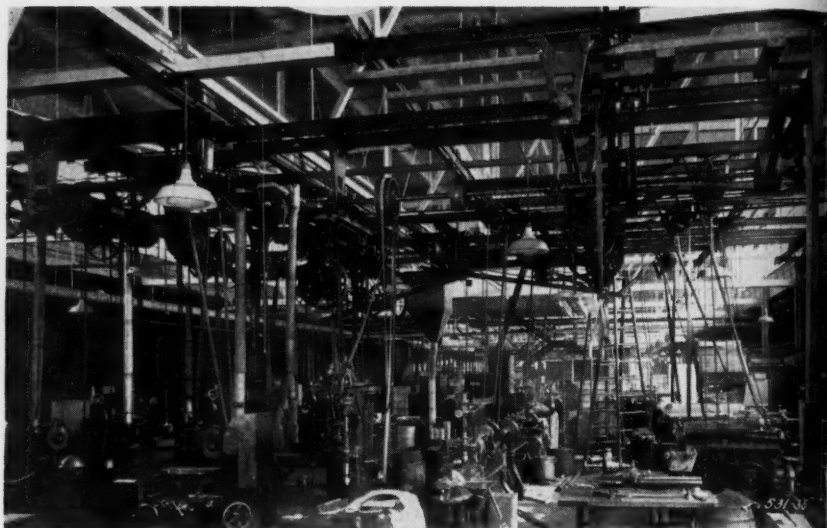
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Special patented steel construction for lineshaft superstructure provides adaptability for mounting lineshafts for group drives. (Photo courtesy Dodge Manufacturing Company.)

monly used up to within the past 20 years. Wood was easily obtainable, could be cut to fit on the job, and satisfactory if properly installed without too long spans between supports. An A-truss construction took care of most long spans satisfactorily.

Objections were: the cost and increasing difficulty of obtaining good timber, excessive loss where a superstructure had to be moved, due to the fact that little of it is reusable, and the tendency of bolts to loosen as the wood aged, especially when subjected to heavy vibration or shifting loads.

### Steel Superstructure

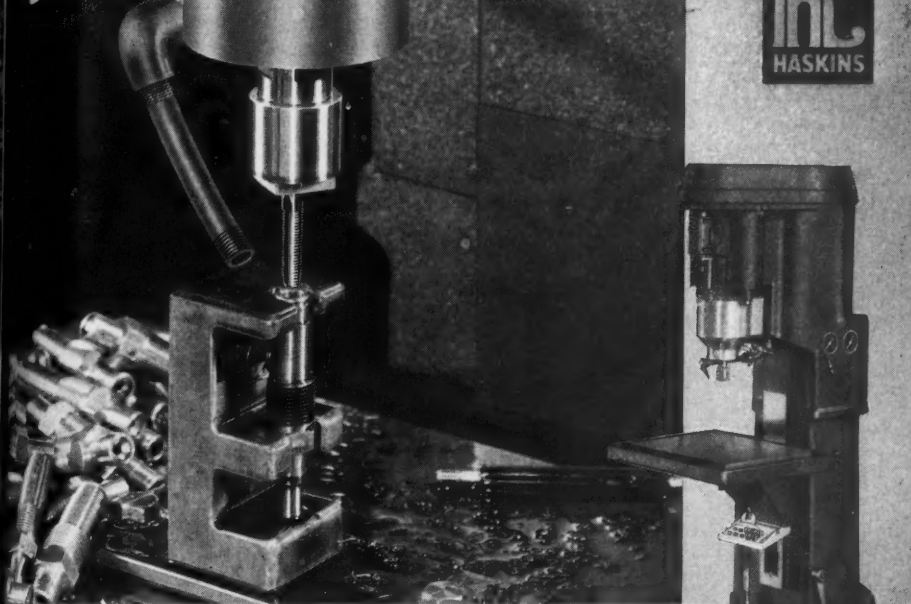
Today steel superstructure is used in practically all modern group drive installations. For this purpose it is now possible to obtain special patented rolled steel shapes in which light weight is combined with high resistance to bending. These are bolt-

ed in pairs to form stringers with spacers between each pair for inserting the vertical bolts used to attach the transmission equipment to overhead beams or for bolting to inserts cast in the concrete ceiling. Similar steel construction is used for the cross footings provided for attaching hangers.

Advantages are: standard construction of permanent material, practically 100 per cent reusable in case of a change in location, rigidity to horizontal and vertical loads combined with light weight, ease of assembly, installation and disassembly with a wrench as the only tool required.

One automobile plant keeps a quantity of this steel in stock. When a group drive is to be moved, steel is taken from stock and the new superstructure is erected. As the floor is usually clear, the superstructure is assembled on the floor and lifted in sections to the ceiling. Lineshafts

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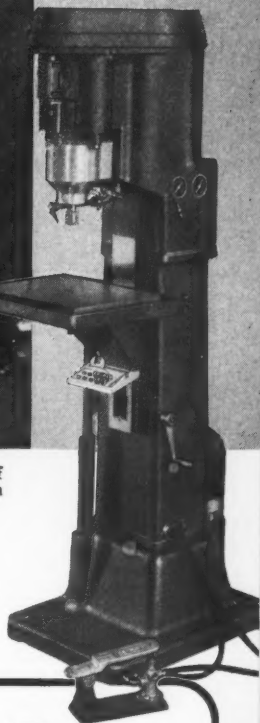
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*Precision*

**TAPPING  
 EQUIPMENT**

European Representative—  
 G. E. Marbaix, Ltd., Humglas House,  
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and hangers are also taken from stock and installed.

Only pulleys and machines are moved to the new location. The original superstructure and lineshaft are then removed, disassembled and stored for the next shift of a group drive. Thus machines can be operated in the old location until everything is ready for them to be removed, which is done with a minimum of interruption and lost time.

Instead of purchasing this special steel for superstructures, many plants build up their own from light structural channels. Longitudinal and cross members are constructed by bolting pairs of channels back-to-back with spacers between to leave an opening for bolts. However, construction is slower than with special patented shapes, as channels must be cut and drilled.

Generally such installations are not

as readily reusable in a new location because as a rule they have been cut to fit and the next installation may require sections of a different length. Patented superstructure material comes in standard lengths and so is more easily adjusted to variable locations. Structural channel superstructure is considerably heavier and little, if any, more rigid than the special shapes. Advantages of structural channels are that such material is easily obtainable from steel warehouses and can be worked up in the shop.

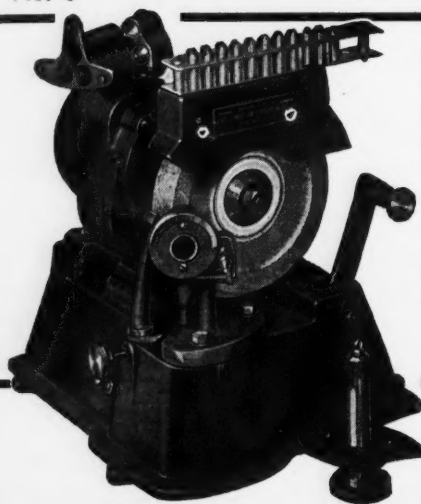
### Ceiling Inserts

Use of inserts cast in ceilings of reinforced concrete buildings aids in ease and speed of erection as well as in making a stronger installation. The tendency of modern factory building construction is to locate inserts on short centers for adaptabil-

No. 1  
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GRINDS  $\frac{1}{8}$ " to  $\frac{1}{2}$ "  
GRINDS  $\frac{1}{8}$ " to  $\frac{3}{4}$ "



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ity. One Chicago plant addition built recently has ceiling inserts on 3-ft. centers, whereas in the older section inserts were on 6-ft. centers. Steel sections 4 ft. long attached to inserts support practically all superstructures, whereas on the older installation, 7-ft. sections were required in all cases.

### Unusual Problems

Machine shops are often installed in buildings not originally designed for or well adapted to group drives. Such is the case in large cities where idle garages are often taken over for manufacturing.

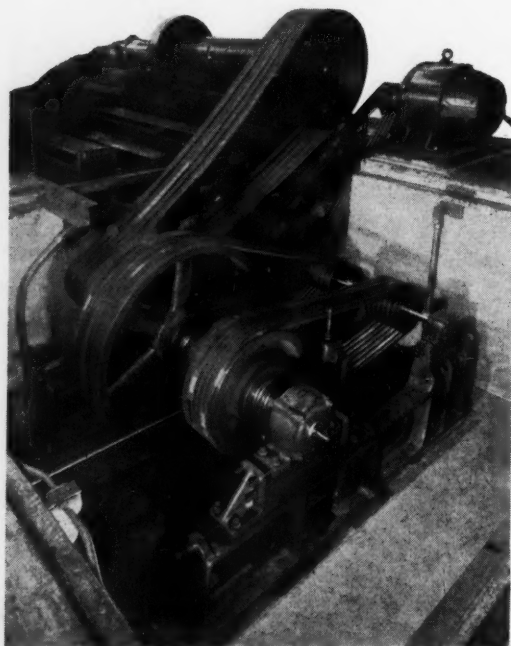
One Chicago plant, for example, signed a lease on a vacant garage to save on rent expense only to learn too late that the wooden roof trusses were too weak and too low to permit installing lineshafts. Extra expense in fixed charges on an all in-

dividual drive installation would have been greater than the rental saving. This was during the depression and the company did not have the money to invest in individual drive.

A consulting engineer solved the problem, and his solution is applicable to practically any similar case. First, as the bottom chord on the roof truss was too low to hang the shafts below the chord, he erected the steel superstructures above the truss chord and mounted the hangers, inverted, and lineshafts on top of it.

This raised the shaft to a safe height and provided a longer and more satisfactory center distance for the open flat belt drives down to the machines. To prevent belt interference with the longitudinal steel channel members of the superstructure, they were placed farther apart than standard practice.

Reinforcing the wooden trusses was out of the question. Instead, vertical 4 x 6-in. wooden posts were used to support the lower chord members of the trusses. In all cases these were placed back of machines or between machines where they do not interfere. The posts are not set in a straight line, as they were placed where most convenient, but this is hardly noticeable and is of no consequence. With these post supports the roof truss is much stronger and safer (it was dangerous with a heavy



In order to save floor space, a two-speed drive to a roll grinder is mounted in a pit which is covered with floor plates. (Photo courtesy Landis Tool Company.)



## How Else Could It Be Done So Economically?

Grinder set-up in Milling Machine grinding radius on metal-cutting saw.

**STANLEY TOOL  
ROOM GRINDERS  
PLAY IMPORTANT  
PART IN MANU-  
FACTURE OF FINE  
METAL-CUTTING  
TOOLS**



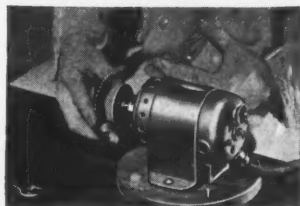
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Grinder bringing center holes of slotting saws to proper diameter.



Grinder burring off center holes of metal-cutting saws.

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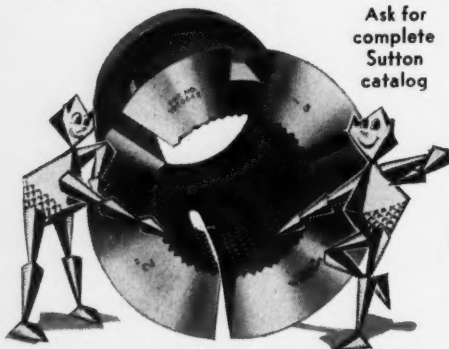
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## Sutton **DIAMOND-GRIP** Collets



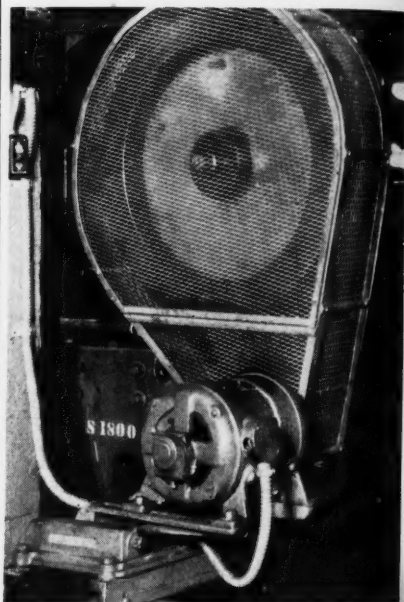
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Accessories for Screw Machines

snow load) than before. From the management's standpoint a bad bargain was salvaged profitably.

Use of similar post supports would help support extra long spans and make an A-truss construction unnecessary. Also, such posts could be used



Although this motor is efficiently and economically mounted on a pivoted base, it is exposed to dust and trucking hazards.

(Photo courtesy Rockwood Manufacturing Company.)

to support long superstructure spans in mill-type building with a shifting load on the floor above, as previously mentioned. Superstructure could be mounted on the heavy beams between columns and supported on posts at necessary points between.

## Adapting Building

Another metal working organization moved into a building originally erected for one of the needle trades. Trusses in sawtooth roof and chords

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VICE



May, 1940

MODERN MACHINE SHOP 129



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tying the building columns together would not support lineshafts. To provide the necessary support, it was necessary to cut I-beams and weld them in horizontally between building columns. Steel channel superstructure was then anchored to these I-beams.

As only about 20 per cent of the total floor space had to be adapted to the group driven machines, the changes were easily and economically made. In this instance the solution had been planned before the building was purchased. Because the real estate market was low and the seller had been turned down by several prospects on account of the light construction, the purchaser obtained the property at a bargain.

Old time mill construction, especially in flour, paper and some textile mills, sometimes makes it necessary to mount the lineshaft on the ceiling of the floor below the machines, or on the basement ceiling, and drive up through the floor.

### Using Tunnels

For example, in a recently-constructed nail mill, tunnels were built below floor level for motors, lineshafts and control equipment. All operation is controlled from push buttons or clutches on the machines. Advantages are that the overhead is unobstructed to permit crane travel and drive equipment in the ventilated tunnels is not subject to lime dust rising from wire drawing operations. This installation makes use of a solid floor and dust-tight enclosures on belts from lineshaft to machine.

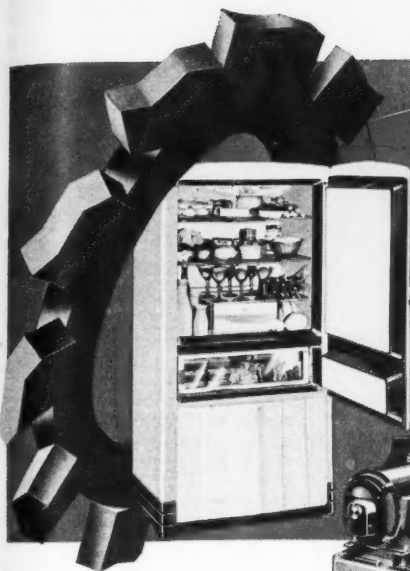
In still another recently-constructed plant, machines are group-driven from lineshafts in parallel floor ducts or trenches. Motors are placed in enlarged sections of the ducts, driving by silent chain on short centers. Floor ducts are covered with steel

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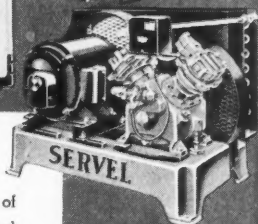
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These sturdily-built refrigerators operate economically and efficiently because *Everlock* washers keep vital parts intact! Pictured are three refrigerators and one compression machine, the manufacturers of which used various types of fasteners and methods for holding their machinery parts together before adopting *Everlock* washers.

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Photographs through courtesy  
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gratings and drains are provided to remove water. Splash-proof motors, a greased lineshaft, and sealed ball bearings prevent water damage.

Practically any drive installation problem can be solved if the engineer in charge has imagination and vision and is willing to deviate from orthodox methods. Standardization is important, but this may be restricted to speeds, motor ratings, shaft diameters and other related factors. Standardization, however, does not necessitate blindly following what someone else does without investigating possibilities of better methods.

**"Why Anti-Friction Bearings"** is the title of a 112-page, profusely illustrated book containing an impartial discussion of the factors to be considered in the selection of anti-friction bearings, now being distributed by the Advertising Department, New Departure, Division General Motors Sales Corp., Bristol,

Conn. The book is designed for use as a text in engineering colleges or by young engineers or others interested in all factors affecting the efficiency and performance of machines through the use of anti-friction bearings.

Copy of the book will be sent to any one addressing a request on his company letterhead.

**Gisholt Lathe Tool Catalog.** An illustrated catalog covering the various standard tools available for Gisholt Type Turret Lathes is now being distributed by the Gisholt Machine Co., 1219 E. Washington Ave., Madison, Wis. This 40-page catalog describes the complete line of Gisholt standard tools, including several new additions such as multiple cutter turners and slide tools. All tools are adaptable to a wide range of work and can be used on other standard makes of turret lathes. Each tool is clearly illustrated and the text matter has been written so as to include information which will enable the operator to select the correct type of tool for a particular job. Copy of Catalog Form 1059B free upon request.



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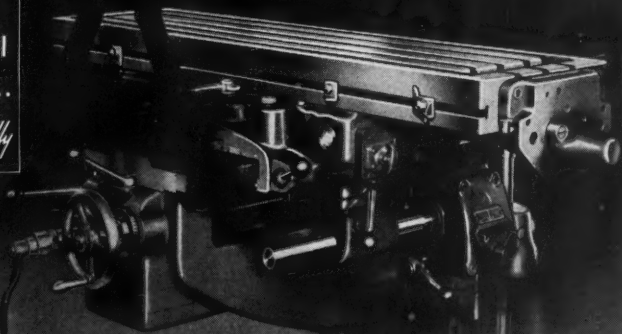
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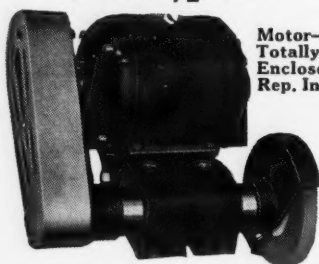


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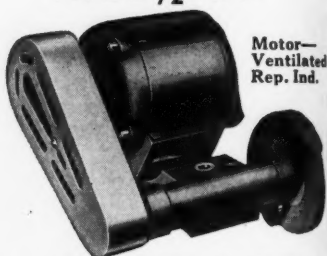
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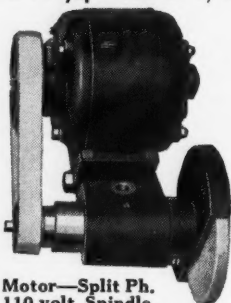
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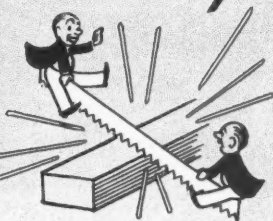
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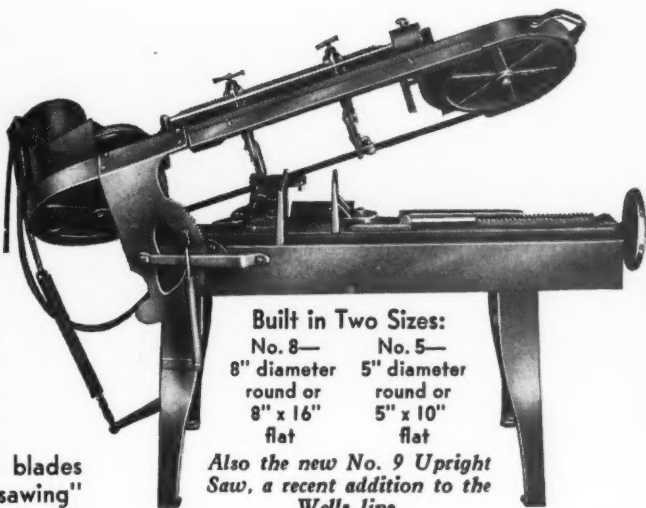
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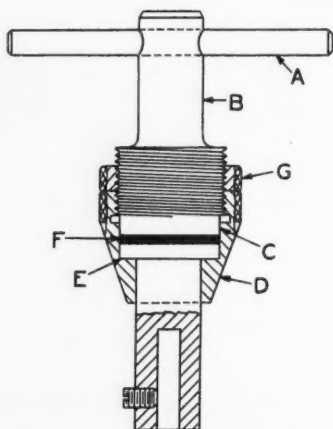


## FROM READERS

### Friction Tap Wrench Saves Taps

By JOHN A. HONEGGER

**O**FTEN in hand tapping a hard spot will be encountered, especially if the material is a high alloy steel. If the tap used is  $\frac{1}{4}$ -in. diameter or less,



Drawing of Friction Hand Tap Wrench

the sudden resistance encountered results in a broken tap. Having had this experience several times, the writer conceived the idea of a friction tap wrench which could be set to release when the applied torque approached the breaking point of the tap. The wrench illustrated in the

drawing is the result.

The general design of the wrench is the same as that of the conventional tap wrench, using a cross pin handle **A** fastened in the threaded shank **B**. On the end of the shank is a pilot, **C**, which fits snugly into the counterbored section of the body **D**. Into this same body **D** is snugly fitted the disc-shaped section **E**, which is a part of the tap holder. Between the tap holder **E** and the shank face **C** is inserted a section of friction material **F**.

To use, the tap is inserted into the hole in the end of the tap holder, where it is clamped by means of the setscrew. The shank **B** is tightened down on the friction disc **F** until the point is found, just below the breaking point of the tap, at which the shank will slip. Then the lock nut **G** is tightened down against the body **D** and the wrench is ready for use.

### Hand Tool Holder

By CHAS. H. WILLEY

**I**N the course of a task which consisted of turning aluminum cases for several hundred switchboard meters, recently, the writer discovered that by using a hand tool made from a worn-out file and ground to the necessary shape, the forming of the fillet in the inside of the case could

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*Write for Bulletin 800A*

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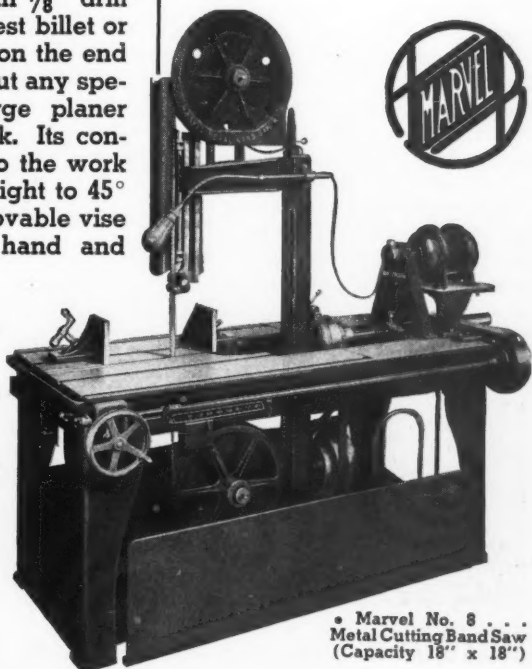
*"The Hack Saw People"*

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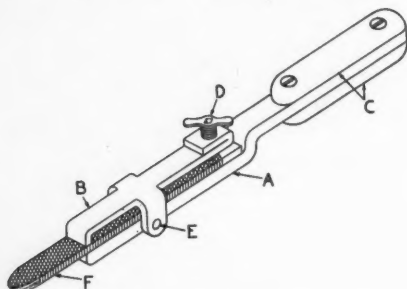
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be done with greater ease and speed and a smoother finish obtained than had been possible with the tools pre-



Drawing Showing Design of Hand Tool Holder

viously used. The tool was difficult to hold, however, consequently the holder shown in the illustration was designed.

The holder consists of four parts; namely, the body A, moveable clamp B, fiber grip pieces C, and the clamping screw D. The clamp B is fastened and pivoted to the handle body A by means of a pin, E. The fiber grip pieces C are anchored to the handle body by two screws, as shown.

In use, the tool, which is designated as F, is slipped between the handle body A and the clamp B to the position shown and the adjusting screw D is threaded down onto the tool. As the end of the screw is forced against

the tool, the jaw of the clamp B is forced against the tool, clamping it firmly in position. The holder can also be used to clamp other hand tools of various shapes.

## Simple Method for Calculating Bore of Threaded Nut

By C. B. CURTISS

**F**REQUENTLY threading standards for nuts call for a "75 per cent" thread. By this is meant a nut in which the depth of the thread of the nut will be 75 per cent of the depth of the thread of the bolt. The United States Form, where the depth of the thread is three-quarters the depth of a V thread, is in general use, and, if the thread of the nut is changed from 75 to 77 per cent, the internal bore of the nut will be the outside diameter of the bolt minus the pitch of the threads. The basis for this formula is as follows:

$P$  = pitch of thread

$0.866P$  = depth of V thread

$0.866P \times 0.75$  = depth of U.S.F. thread or  $0.6495P$

$0.866P \times 0.75 \times 0.77 = 0.500P$  or  $\frac{1}{2}$  of the pitch

The inside diameter of the nut will then be equal to the outside diameter minus the pitch of the threads.



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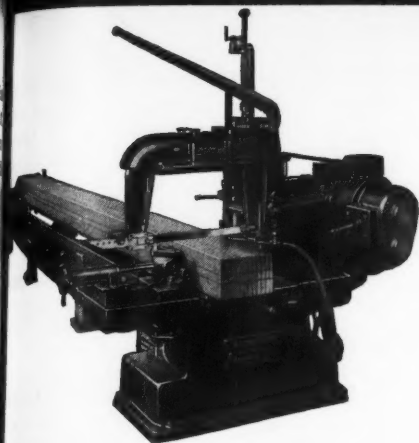
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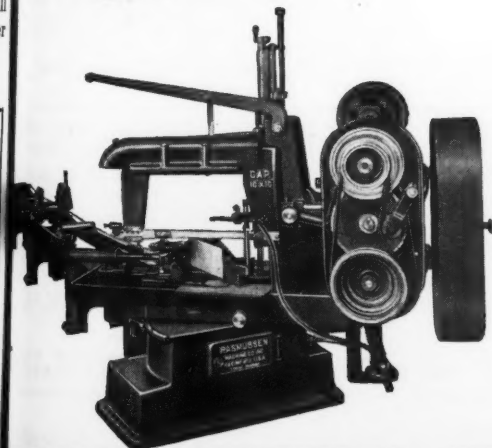
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direct for circular.

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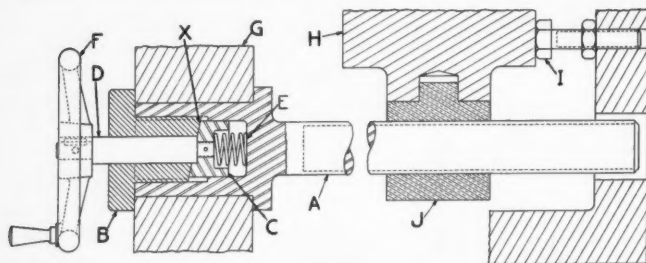


**RASMUSSEN MACHINE CO., INC.** 9 Main St., Racine, Wis., U. S. A.

## Slip Mechanism for Tapping Machine

By W. M. HALLIDAY, *England*

**I**N many instances the danger of overloading a tapping machine can be eliminated through the use of a slip mechanism similar in construction to the one shown in the drawing herewith. This mechanism was designed



Drawing Showing Application of Overload Slip Mechanism to Multiple Spindle Tapping Machine

by the writer for use on the slide feed screw of a special multiple spindle tapping machine of the horizontal type. The drawing shows a sectional view of the work-holding slide, together with the actuating screw. The slide was equipped with 12 tapping stations (not shown) making it possible to tap 12 small die castings simultaneously, the operation of the actuating screw being controlled by means of a handwheel.

The slide feedscrew, indicated at A in the drawing, is made with an enlarged plain end which is set off from the threaded portion by a shoulder. The plain end referred to being passed through a bearing G, provided for it in the machine structure. The plain end of the screw is also bored out to take the assembly consisting of the spring E, shaft D, sleeve B, and part C. Part C is a steel piece, drilled and bored to fit the shouldered end of the

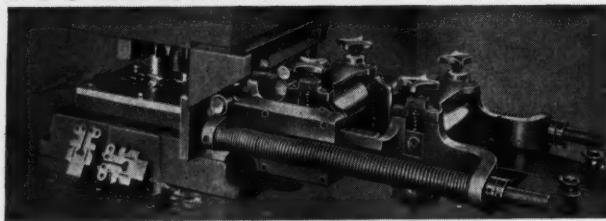
shaft D and counterbored to provide a seat for the spring E. Part C is pinned to shaft D, as shown, and the outer end of the part is milled at a 12-deg. angle which corresponds with the angle on the end of the sleeve B.

Sleeve B is threaded to fit a corresponding thread in the end of the screw; thus it is firmly locked in position when assembled. Motion is conveyed from the handwheel F through the screw A to the nut J, which is attached to the underside of the work slide H. An adjustable stop, I, is fixed in the end wall of the machine frame to stop the travel of the work slide at the desired point.

Operation of the slip mechanism is

## DICKERMAN DIE FEED

FOR QUICK SET-UPS ON SHORT OR LONG RUNS



Handles coiled stock of any practical thickness. Maximum stock width 4". Adjustable from 0 to maximum feed length of 3" in increments of .001". Accurate.

**H. E. DICKERMAN MFG. CO.**

282 WILBRAHAM RD. SPRINGFIELD, MASS.

# UNBRAKO

## SELF-LOCKING SET SCREWS For Unfailing Grip



Fig. 1646  
Pat's. Pending



Fig. 1645  
Pat's. Pending

"Unbrako" Self-Lockers incorporate many advantages which, on your machinery, will prevent breakdowns and production delays caused by ordinary set screws working loose. Not only that, but they'll reduce your maintenance costs as well. Just set them up with no more than ordinary pressure and the ingenious knurled points automatically lock into place with a grip that holds no matter how severe the vibration. Yet "Unbrako" Self-Lockers are easy to adjust and they may be used over and over again with always the same dependability. Let these advantages save \$ and trouble for you—drop us a note for complete details.

## SOCKET SCREWS

The toughest alloys, heat-treated to provide an almost unbelievable strength... precision machining to micrometric specifications... careful inspection of the finished product, qualify "Unbrako" Socket Screws for service wherever quality characteristics are a necessity.



Fig. 232  
"UNBRAKO"  
Hollow Set Screw



Fig. 1434 Knurled  
"UNBRAKO"  
Socket Head Cap  
Screw  
Pat's. Pending

These Socket Screws also combine design features which distinguish them from ordinary Socket Caps and which make them your logical choice. Look at the knurled heads for example—found only on "Unbrako" products. They provide a **"Better-Grip"** for the mechanic's fingers or pliers, prevent fumbling—hence speed up production. There are other advantages, too... write for catalog and samples!

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# ONLY.. MOTO-TOOL

... has  
**EXTRA  
SPEED  
and EXTRA  
POWER-**



**MASTER  
MODEL  
ONLY  
\$16.50**

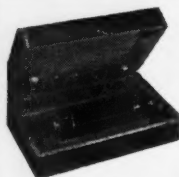
... No other motor-in-hand tool is so packed with power. It allows precision work without the delay of removing and re-setting larger tools. Used in hundreds of industries on hundreds of jobs. Sold by better dealers—on 10-day money-back guarantee. Catalog of Dremel equipment FREE. Write today.

- Operates at 27,000 r.p.m.
- Handles over 200 accessories.
- Has vibrationless, finger-tip balance.
- Has oil-less (oil-sealed) bearings.
- Has built-in cooling fan.
- Dust excluded by vacuum - cleaner type filter.
- Weighs only 13 oz.
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**DREMEL MANUFACTURING CO.**  
Dept. 220-E Racine, Wisconsin

## 100 TOOLS IN ONE

**GRINDS—CUTS—ROUTS—SAWS  
POLISHES—SHARPENS—SANDS**



### MOTO - TOOL KIT

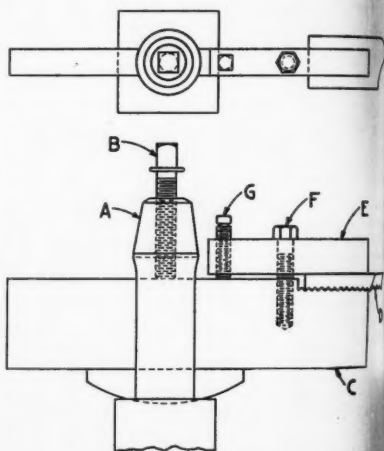
—with 23 accessories...  
points, carving cutters,  
saw, brushes, sanding  
disks, mandrels, chucks,  
etc.—  
only . . . **\$23.50**

as follows: The feedscrew **A** is rotated by means of the handwheel **F** until the workpiece, held on the workslide **H**, is prevented from further movement by the stop **I**. Continued turning of the handwheel causes part **C** to ride up on the cam face of sleeve **B**, compressing spring **E** sufficiently to let part **C** make a complete revolution. Thus the handwheel can be revolved while the workpiece is stationary.

## Special Toolholder for Contour Finishing

By JOHN E. HYLER

**A** TOOLHOLDER designed for use with a variety of tools is presented in the drawing herewith. The holder is especially useful in contour



**A** Variety of Contour Finishing Cutters can be Used with this Toolholder

finishing, assuming, of course, that the cutters are of approximately the same thickness and are grooved or "corrugated" on the bottom to fit the corrugations that have been made in the top surface of the holder.

# Welded STEEL Machine BASES

## ... for Greater Strength and Better Appearance

Fabrication of Welded Steel Machine Frames and Bases is an art in which skill and workmanship show up immediately . . . proper equipment and highly efficient craftsmen are essential to meet the demands of progressive machine builders today. The R. C. Mahon Company, realizing the importance of finished appearance, as well as accuracy, in this field, set out to devise fabricating methods which would assure not only accuracy of dimension, but the utmost in fine workmanship—a smoothness and trueness in finished appearance unsurpassed anywhere. If you demand machine bases of exceptionally fine finished appearance—bases upon which you will be proud to place your company's name, send your blue prints to Mahon for quotations.

**THE R. C. MAHON COMPANY**  
DETROIT, MICH.

*Manufacturers of Machine Frames and Bases  
and Many Other Steel Products*

At the right is reproduced an unretouched photograph of a Welded Steel Machine Base produced by Mahon for the Fox Five-Way Drilling Machine for which base was built.

# MAHON

The toolholder, A, is made to fit the ordinary lathe toolpost and is "stepped" at the front end, the height of the step being somewhat less than the thickness of the thinnest cutter that is to be used. The step should be cut back far enough to simplify the task of gripping and holding the cutters. The face of the step is cross-grooved or corrugated so that a cutter with corresponding corrugations can be held without danger of slippage under pressure of a cut. As the cutter is used up in sharpening, it can be moved forward one groove at a time.

The cutter is held firmly in its seat by the steel clamping block E, which is drilled for the capscrew F and drilled and threaded for the setscrew G. With the clamping block E resting horizontally on the surface of the cutter, the capscrew F is threaded down until the head rests on the

block. Then the setscrew G is turned, applying pressure to the front end of the clamping block to hold the cutter in place. A small pocket is provided in the top surface of the toolholder for the end of the setscrew G, so that block E will not swivel if it is accidentally bumped.

#### Correction

In the article "Avoid Overloading High Friction Belts" by W. F. Schaphorst which appeared on page 114 of the March, 1940, issue of this magazine, the statement was made that a "single-ply belt 1 in. wide, running at a speed of 200 ft. per min., will transmit one horsepower." This should have read "800 ft. per min."

**Pyroelectric Furnaces**, precision controlled for precise heat processes, are described and illustrated in a bulletin released by the Pyroelectric Company, Trenton, N. J. Copy free upon request.

**Notably reduces  
power loss...**



**HYDRAULIC CYLINDER  
PISTONS are SEALED  
with PACKINGS**

On test these cylinders show a 95% average efficiency for pressures from 500 to 2000 pounds per square inch. The packings eliminate slippage and provide as nearly as possible the theoretical exerted power.



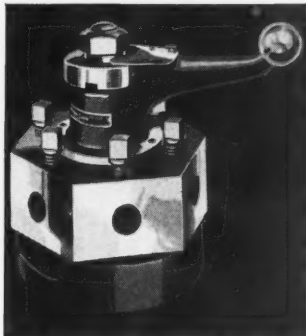
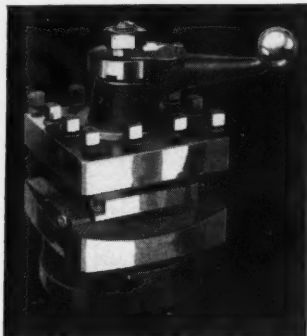
**CATALOG H-37** reports on additional construction features and complete cylinder specifications. Your copy will be sent promptly. Address The Tomkins-Johnson Co., 620 N. Mechanic St., Jackson, Michigan.

*this is a* **TOMKINS-JOHNSON** *product*



# CUT OUT TIME-OUT

## *for changing lathe tools*



If you are planning to use an engine lathe for a production job requiring two or more operations, investigate the time-saving advantages of equipping the lathe with a McCrosky Turret. It will enable the operator to set up all tools before he starts production. As each successive tool is needed, he can index it quickly and accurately into position without stopping his machine — all McCrosky Turrets have 12 indexing positions . . . Six styles, many sizes, all ruggedly built.

Ask for

**McCrosky**



**BULLETIN**  
**No. 15-E**

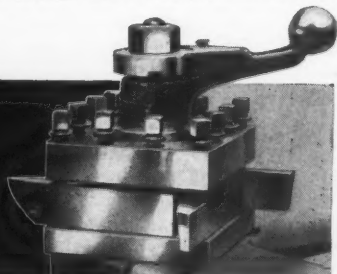
## McCrosky TOOL CORPORATION

MEADVILLE, PA.

### McCrosky

### TURRET TOOL POSTS

*Speed up lathe production*





## Over the Editor's Desk

### Commencement

**C**OMMENCEMENT time is almost here; the hour when students who have spent years and possibly thousands of dollars in obtaining educations will "commence" their careers. Actually, thousands of these students will commence by looking for positions. By autumn a good portion of this number will be in search of *employment*, and in another few months many of these will be looking for JOBS. At this time next year there will still be thousands of young men out of work, cynical, discouraged, wondering what is the matter with the world anyway, and ripe for any movement that would seem to be the answer to their economic problems.

The best of the crop will have been taken where openings existed; others will have found positions through family friends or "pull," but there will still be many upon whom Luck has not smiled. At the same time there is a shortage of good mechanics in many lines; floor finishers, door hangers, expert machinists, tool and die makers, and many other types of craftsmen who have to be skilled with their hands as well as their heads. These trades are not learned in college, it is true, but opportunities can be found if one really wants to learn.

There seem to be two main reasons why the average college graduate is not interested in a trade. The first is, of course, that he has spent a great deal of time and dad's money fitting himself for something better, and the second is that he feels that

his opportunities for success will be limited. As to the first; many a potential good mechanic has been ruined to make a mediocre engineer, and many a potential good citizen has been ruined by over-education. As to the second; if the student could but see it, his chances for success in any kind of productive work will be multiplied if he will learn the processes of production by actual experience in the shop or field.

A college education is a fine thing to have, but a college graduate out of a job is just as useless and perhaps just as much of a liability to society as an unemployed hobo. It may be that the parents are not without guilt, in that they educate their children for "success" rather than for happiness, entirely overlooking the fact—and it is a fact—that the rich man who hasn't found happiness is a failure, while the person who is happy with what he has where he is, is a success.

One way to find happiness is to learn how to do one thing well, but the young man with a brand-new diploma in his hand is not at the end of his training; he is at the beginning. He has prepared himself to begin learning, and the place to begin is at the bottom. His education, coupled with experience, should in time bring him to the top, but he must realize that there is no substitute for experience—not even education.

Many an employer who has no room for an additional office worker will make room in his plant for the graduate engineer who is willing to don overalls, be on the job when the whistle blows in the morning, and get his hands dirty learning how to operate a machine. The next best bet is to take a mechanical training course in a good grade school; a year in such a school is an invaluable aid to getting a job. The important thing is to get started.

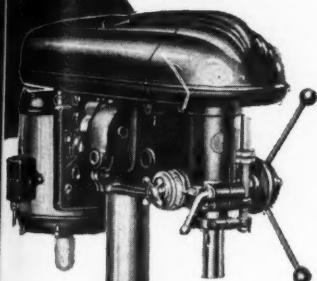
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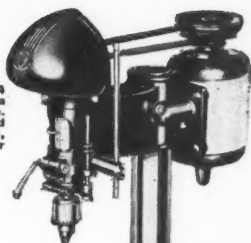
**\$89.50**

No. 1370 Floor-type 17 in. "Slo-Speed" Delta Drill Press with No. 2 Morse Taper Spindle and Standard Tilting Table, without motor or switch.



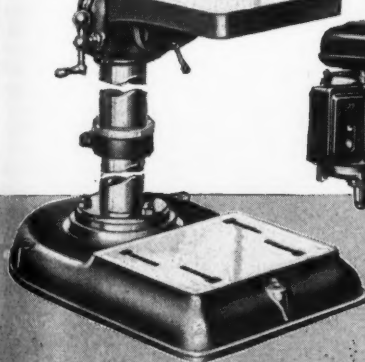
**\$41.85**

No. 989 Floor-type 14 in. High-Speed Delta Drill Press with 1/2 in. Jacobs Chuck and Standard Tilting Table, without motor or switch.



**\$114.50**

No. 1375-M Bench-type 17 in. High-Speed Delta Drill Press with No. 2 Morse Taper Spindle and Production Style Bench Base, without motor or switch.



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Fill out and mail coupon for Special Drill Press Bulletin giving full details, description and prices of the complete line of Delta Drill Presses.

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 (INDUSTRIAL DIVISION)  
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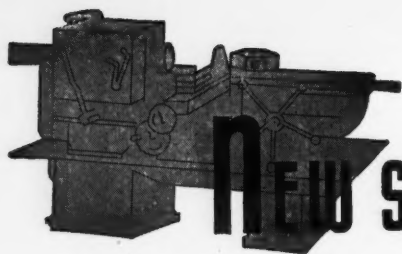
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# NEW SHOP EQUIPMENT

## Ohio Units Model N-301 Universal Superfinisher

The illustration shows the Ohio Units Model N-301 Universal Superfinisher which has been developed by Ohio Units, Dayton, Ohio, for general use in automotive and other shops for "superfinishing" crankshafts, brake drums, flat surfaces such as flywheels, discs, and so on, and for use in machine shops producing quality parts in limited quantities.

The oscillating head which carries the superfinishing stones is mounted on a carriage which can be manually traversed to permit the stones to come in contact with the full length of the work. The head can be quickly adjusted to any position required, depending upon the size of the work, and is

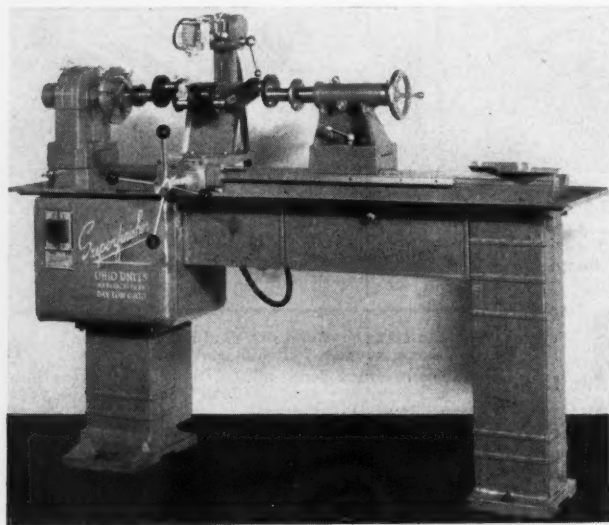
driven by a flexible shaft from the main driving motor. The tension of the stones against the work is controlled through a spring adjusting device which can be instantly set to the tension desired.

A gear type pump with a maximum capacity of  $1\frac{1}{2}$  gal. per minute is mounted in the base and is driven by the motor which furnishes power for the entire machine. Lubricant is delivered to the work through a flexible tube connection. The pump is equipped with an internal relief valve so that the flow may be adjusted to any capacity desired. Suitable fittings are supplied for connecting the tube to various stone holders.

The Ohio Units Model N-301 Universal Superfinisher has a 14-in. swing over bed and an 11 $\frac{1}{8}$ -in. swing over carriage. Raising blocks are available for the

headstock and tailstock for increasing the capacities to a 17 $\frac{1}{8}$ -in. swing over bed and a 15 $\frac{1}{2}$ -in. swing over carriage. The carriage is arranged for manual traverse through a rack and pinion drive and rides on hand-scraped V and flat surfaces, assuring alignment.

The headstock is equipped with an alloy steel spindle running in bronze bushings. Bearings of the headstock are



Ohio Units Model N-301  
Universal Superfinisher

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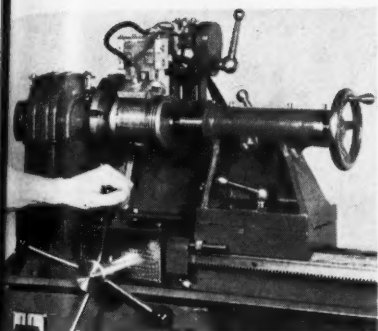
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1940



**Superfinisher Set Up to Superfinish Pistons.**  
**The Table of This Machine is Traversed By Hand**

protected by oil seals to prevent en-  
trance of dirt or foreign matter and  
are equipped with sight feed oilers. The  
spindle is bored with a No. 4 Morse  
taper and the front end is threaded.  
The tailstock, which is of heavy con-  
struction, is also equipped with a No. 4  
Morse taper. The maximum length be-  
tween centers is 49 inches.

The Model N-301 machine is driven by  
a ½-h.p., 110-120-volt, 60  
cycle, back-geared motor  
controlled by a double  
pole switch at the front  
of the machine. The ma-  
chine is 22 x 78 x 56 in.  
overall and has a ship-  
ping weight of 1,045 lbs.

## Cincinnati Dial Type Milling Machines

The Cincinnati Milling  
Machine Co., Cincinnati,  
Ohio, has placed on the  
market a line of plain,  
universal, and vertical  
dial type milling ma-  
chines designed for the  
accurate and rapid re-  
moval of metal. These  
machines are built in

three sizes; namely, the Nos. 2, 3, and  
4, and in two speed-feed ranges for  
medium speed and high speed.

Speeds and feeds are controlled by a  
single lever at the front of the machine  
and are duplicated at the operator's  
rear working position. The lever has  
two positions, "speed" and "feed."  
When moved to the speed position, the  
speed dial at the left-hand side of the  
column rotates. When the lever is re-  
turned to neutral, the dial stops, and  
the proper gears are in mesh to obtain  
the spindle speed indicated by an arrow.  
The machine does the actual gear shift-  
ing; the operator simply moves a small  
lever which releases the power for shift-  
ing the gears. Feeds are changed in  
the same manner.

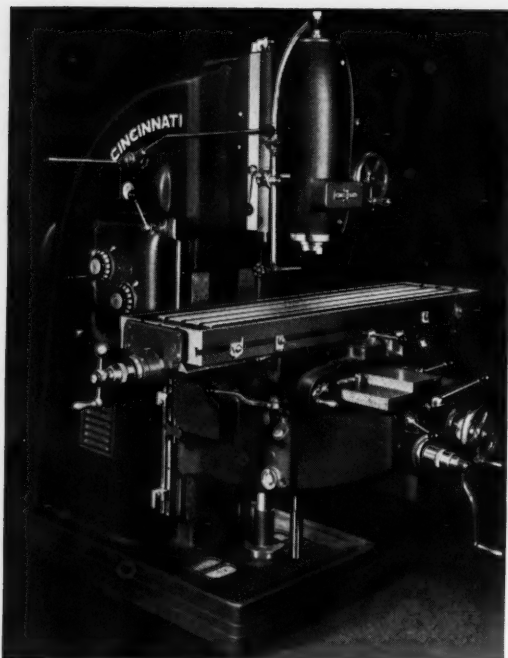
All power control and hand adjust-  
ment levers are conveniently arranged  
at the front operating position. These  
controls are also duplicated and simi-  
larly arranged at the rear working po-  
sition (at the left-hand side of the col-  
umn). Power feed controls at the front  
of the knee are also arranged to pro-  
vide maximum convenience of opera-  
tion. Power longitudinal, cross, and ver-  
tical feeds are engaged by independent  
feed levers. All sizes and styles of the



**Cincinnati No. 2 Universal  
Dial Type Milling Machine**

May, 1940

MODERN MACHINE SHOP 151



Cincinnati No. 3 Vertical Die  
Type Milling Machine

machine have power rapid traverse in six directions.

The spindle mounting conforms to the proven Cincinnati design of four anti-friction bearings; two bearings at the front end and two at the rear end. Rear bearings are mounted in a sleeve to permit normal expansion and contraction in the length of the spindle.

Automatic lubrication of the principal units is said to reduce daily attention to little more than a quick inspection. All parts within the column and knee

units are automatically lubricated, while the parts within the saddle are lubricated by a single oil-shot system.

The column is heavily constructed, wide at the base and at the overarm, and is made of Meehanite metal. Heavy ribbing throughout is said to increase the strength of the column and thereby permit the operator to run the machine at maximum cutting capacity.

A hydraulic Servo control incorporated with the spindle drive starting lever, performs the task of engaging the clutch and thus relieves the operator of all starting effort except a light touch on the starting lever. According to the manufacturer, positive and full engagement of the clutch is obtained when the spindle is rotating; engagement is instantaneous and, since the Servo control also operates the spindle

brake, the spindle stops rotating instantly when the clutch is disengaged.

All power control levers are of a handle design for easy manipulation. Micrometer dials are designed to provide greater convenience, added safety, and increased accuracy of setting. A momentary cut-out switch located at the rear of the machine further adds to the safety. The large speed and feed index dials on the side of the column have white numbers on a red plastic base, and power control levers have black plastic knobs.

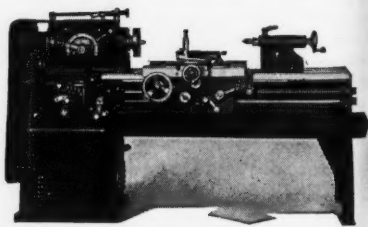
## "C & J" 15" and 16" Lathes

12 Speed Geared Head-Motor Drive  
Timken mounted spindle

Modern Design ... Liberal Dimensions

*Write for bulletin*

**The Carroll & Jamieson Machine Tool Co.**  
BATAVIA • OHIO, U. S. A.





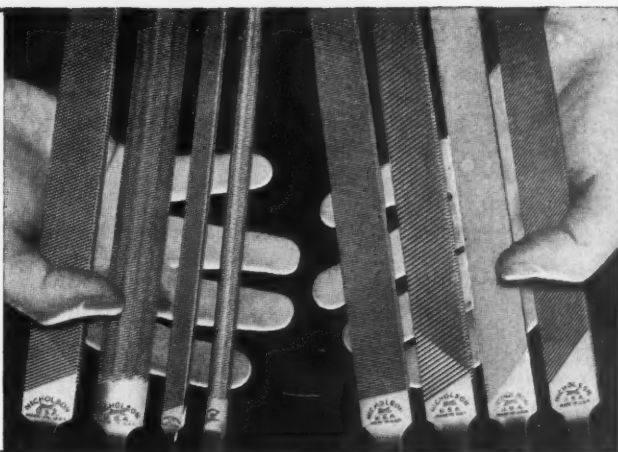
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## YOU'VE GOT THE FILE SITUATION WELL IN HAND

with files made  
to fit the job



Left to right: Flat, Half Round, Square, Round, Brass, Aluminum, Long Angle Lathe, Shear Tooth

For every industrial or machine-shop  
there's a Nicholson or Black  
Diamond File that's right.

Nicholson industrial-file manufacture  
starts with a study of what a file en-  
counters and must do on a specific kind  
of work. . . . The character of the material  
(basic metal, alloy, texture, toughness,  
hardness, etc.); the general design of  
the part (plain, irregular, cylindrical,  
shouldered, etc.); the method of filing  
(bench, machine, assembly line, etc.);  
whether speed or exactness, volume  
stock removal or finishing, is the con-  
trolling factor.

A nation-wide field force is constantly  
studying industry's filing problems—re-  
porting them, aiding production heads  
in solving them. The priceless informa-  
tion and experience acquired over a  
period of 76 years enable Nicholson to  
make more than three thousand file  
types, shapes and sizes—each right for  
the job. And every production run is so  
uniform in steel quality, cut and temper  
that Nicholson and your mill-supply

house can confidently guarantee you  
*Twelve perfect files in every dozen.*

**NICHOLSON FILE CO., Providence, R. I., U. S. A.**  
Canadian Plant, Port Hope, Ontario



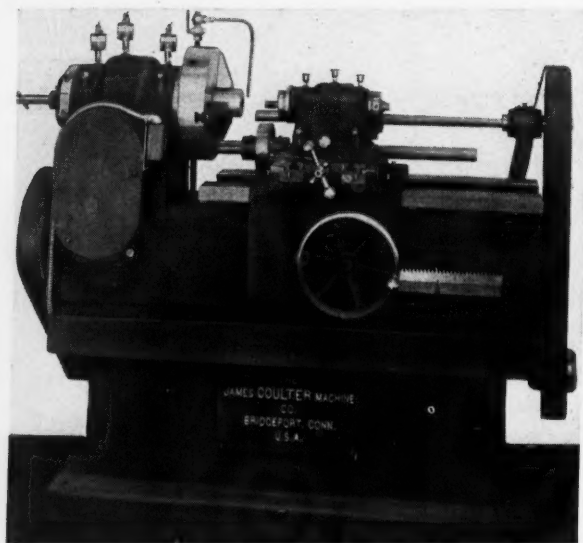
### WORKING ON BRASS?—here's your file

Brass, a "greasy" metal, tends to shred and, after a few strokes, to clog up the teeth of a regular file. The studied and tested angles of overcut and upcut in a Nicholson or Black Diamond Brass File reduce pinning up or clogging. Teeth are very sharp—give excellent results under light pressure and slow stroke. Made in Flat and Half Round shapes—plainly marked "Brass."

# NICHOLSON FILES

FOR EVERY PURPOSE





### Coulter Type "H" Semi-Automatic Hob Thread Milling Machine

Shown herewith is the Type "H" semi-automatic hob thread milling machine which has been brought out by The James Coulter Machine Co., 386 Mountain Grove St., Bridgeport, Conn. The machine is provided with a bed 52 in. in length which is mounted on a substantial base having an enclosed lubricant tank. Additional features include a work spindle housing and spindle with 4-in. hole and flanged end on which a universal chuck, master collet chuck, or fixtures can be readily at-

Coulter Type "H" Semi-Automatic Hob Thread Milling Machine

tached; a milling spindle of large dimensions and suitable taper bearings for take-up adjustments; a worm and gear drive direct from the motor, and pick-off gearing for variations in speeds or feeds required in milling various diameters. By means of cam shaft control, the machine can be arranged to operate automatically after the hob has been set to the exact depth to which work is to be milled.

The Coulter Type "H" Semi-Automatic Hob Thread Milling Machine

is standardly equipped with motors for the work and cutter spindles, oil pump, tank, piping, and lead cam and hob cutter of any pitch specified. Workholding chucks, a master collet chuck, and either hand or air-operated inserts can be furnished as extra equipment. The machine requires a floor space of 60 x 38 in. and weighs, net, 3,000 pounds.

### E. C. No. 540 Universal Routing, Milling, and Drilling Machine

Developed by Ekstrom, Carlson & Co., Rockford, Ill., the Universal Routing, Milling, and Drilling Machine shown here is intended for the machining of both wood and metal. The machine is equipped with a large, heavy-duty alloy steel spindle, the upper portion of which is a splined unit. The complete spindle is mounted on precision ball bearings. It has an actuated travel of 8 in. and a maximum spindle collet diameter for 1-in. straight shanks.

The entire head and spindle assembly can be tilted 90 deg. in either direction or in a complete range of 180 deg. The spindle head is graduated in degrees, and the machine is equipped with a hand brake for quick stopping. Eight

**TRICO**

**AUTOMATIC OILERS**

**SAVE TIME—OIL—WORRY**

**OPTOMATICS and LEVOMATICS**  
maintain a constant level of oil in ring and ball bearings.

The **DRIP-DROP** is a thermal oiler dropping oil on the bearing from the top exactly as needed.

**TRICO FUSE MFG. CO.**  
MILWAUKEE, WIS., U.S.A.

WRITE FOR LITERATURE

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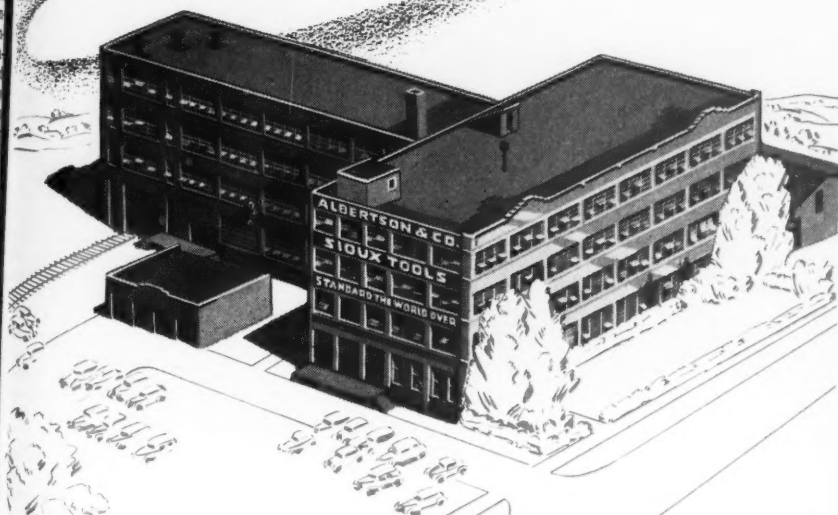
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# Where Sioux builds exceptional quality into its tools



**B**ACK of SIOUX Tools is this modernly equipped plant where efficient and economical operation is built into every tool produced by it.

Quality isn't something that can be argued into a piece of equipment or promised into it. **It must be put there.**

Over twenty-five years of

steady and increasing demand for SIOUX Tools proves conclusively that they have what it takes to meet the most exacting requirements—that they make possible quality jobs in a minimum of time.

Ask the SIOUX Distributor for a demonstration or write for full information.

STANDARD THE  
ALBERTSON & CO., INC.



WORLD OVER  
SIOUX CITY, IOWA, U.S.A.

spindle speeds are provided, ranging from 600 to 7,200 r.p.m. The spindle has a device for locking it into position and

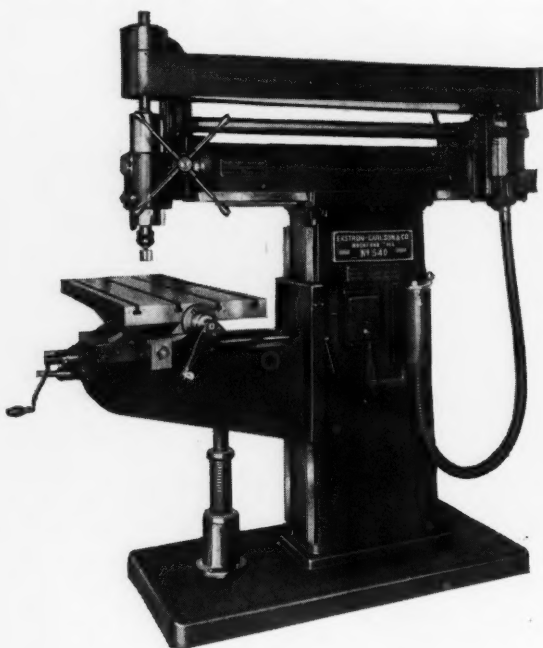
is provided with a carriage that enables the table to be tilted 30 deg. in either direction; toward or away from the column. Longitudinal movement of the table is 30 in.; transverse movement is 16 in., and all movements are provided with micrometer adjustments.

The table-ways are planed and scraped to fit the knee and an adjustable gib is provided to compensate for wear. The knee is also provided with adjustable gibs. Additional support is given to the knee by the telescoping screw.

The column is of the heavy cored box type and the top of the column has planed and scraped ways on which the head assembly can be moved by means of a hand crank. The head assembly travel is 26 in., providing maximum throat clearance of 33 in., and the spindle can be moved to within  $4\frac{1}{2}$  in. of the column.

The machine is regularly equipped with a four-speed motor, but any type of motor required can be supplied. A four-speed control which permits speeds to be changed while the machine is in operation is also furnished. The push button starter is mounted in a convenient location.

The motor drives a two-speed step cone pulley which is connected by an endless woven belt to a similar pulley of smaller diameter, thereby providing eight speeds with a four-speed motor. Floor space required, 90 x 105 in. Overall height, 88 in.




**E. C. No. 540 Universal Routing, Milling, and Drilling Machine**

is provided with a depth stop.

The table is of ample size to accommodate large work, being 18 in. wide by 48 in. long by  $2\frac{1}{4}$  in. thick. The vertical adjustment range is 24 in. from the lowest to the highest position. The knee

... for more than 1001 odd jobs



The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeals to every operator. That's why you'll find the better shops equipping with the Hjorth Lathe.

*Write today for data and prices.*

**HJORTH LATHE & TOOL CO., 12 BEACON ST., WOBURN, MASS.**

## No. 1 of a Series of Interesting Case Histories

## SUNNEN Precision Honing Machine

Subject:

### Production Increased More Than 100% Limits of .00005 inch for straightness and roundness maintained

THE job is that of finishing the cylindrical hole in a hardened steel compressor roller. Using the Sunnen Precision Honing Machine enables this manufacturer to maintain .00005" limits of straightness and roundness and to secure a super-smooth finish. Production was stepped up to about 90 jobs per hour—an increase of more than 100% over the previous method. Sunnen Honing now corrects "tenth" errors more quickly and accurately than was possible with the more expensive equipment formerly used on this job.

#### Solves Five Problems for the Tool Engineer

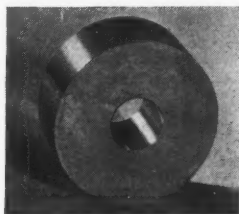
The Sunnen Honing Machine:

1. Corrects errors of out-of-

round and taper produced by previous operations.

2. Produces super-smooth surface finishes.
3. Accurately finishes holes to very close tolerances as to size and straightness.
4. Maintains alignment already established by previous operations.
5. Provides a simple, low cost production method for accurately duplicating sizes.

It is ideally suited for assembly operations, repair and salvage work, short run production, tool room and experimental work and for the job shop.



Compressor Roller

When specifications demand straight, round holes, there is no faster, more accurate method of finishing than the Sunnen Precision Hone.

#### Wide Range

The Sunnen Precision Honing Machine handles any straight, round internal cylindrical surface free from full length key way from .245" to 2.400" diameter and up to 7" in length with a guaranteed accuracy of .0001"—providing positive alignment.

#### Let Us Prove It Free

Send us several samples of parts which you are now finishing by other methods and tell us your problems. We'll hone them to your specifications and return them with complete operation data, or write today for complete bulletin on Sunnen Precision Honing. It's free.



Dial micrometer stop adjustment permits setting the stone to remove only the desired amount of metal, prevents going oversize. Cutting pressure may be quickly set for light or heavy pressure. Shipped complete with  $\frac{3}{4}$  horsepower, 110 volt, 60 cycle motor.

SUNNEN

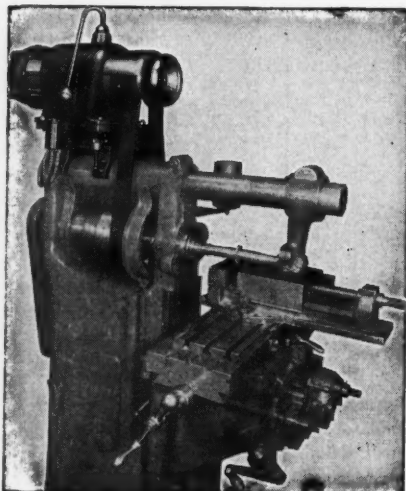
## SUNNEN PRODUCTS CO.,

7933 Manchester Avenue  
St. Louis, Mo. • Chatham, Ont.

# MODERNIZE YOUR SHOP

with

## LIMA Gear Shift Motors



### Features . . .

Eliminates countershafts... 4 speed automotive transmission... All steel, heat-treated gears run in bath of oil... Hand wheel rotation of machine spindle... Instant reversibility with all speeds... Designed for 1800, 1200 and 900 r.p.m. motors, either single or two speed... Adaptable for flat or "V" belt... Easily installed. Compact, patented unit.

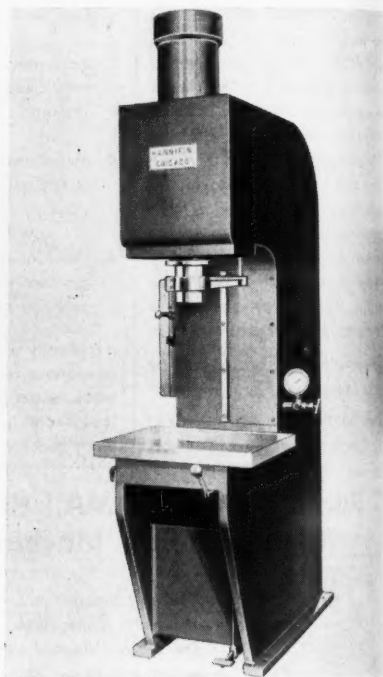
*Write for complete information.*

**L I M A**  
**ARMATURE WORKS, Inc.**  
438 N. MAIN ST. LIMA, OHIO

Standard equipment includes a 3 h.p. four-speed motor, four-speed controller, magnetic starter with push button control, hand brake, and depth stop, collar for 1/2-in. shank, 143-in. belt for low speeds, 148-in. belt for high speeds, 1-in. router bit, and the necessary wrenches.

## Hannifin 25-Ton Hydraulic Forcing Press

Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill., has developed the 25-ton hydraulic forcing press shown



Hannifin 25-Ton Hydraulic Forcing Press

herewith. The press features welded steel frame construction, a built-in hydraulic power unit driven by a 10 h.p. motor, and a Hannifin sensitive pressure control which provides an infinitely variable pressure from a few pounds to full capacity and is controlled by a single finger tip control lever.

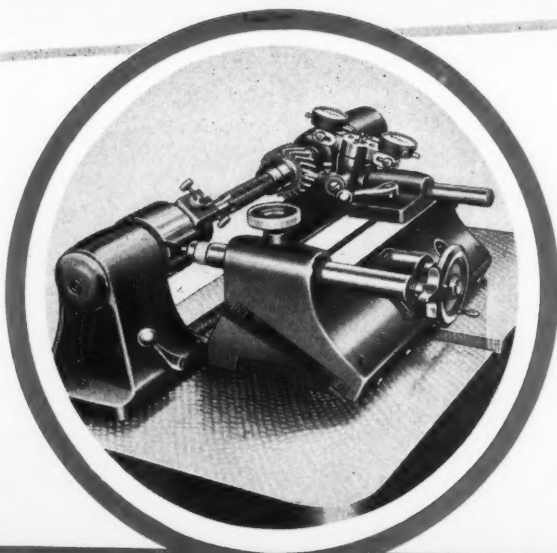
The Hannifin 25-Ton Press is 113 in.



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## FAST, ECONOMICAL MEANS OF *Checking* GEAR TOOTH LEAD

You can check the lead of helical gears on a Red Ring Comparator in about a third of the time required on any other lead checking device—and you can read errors to "Tenths". The secret of this machine is its ingenious simplicity and ease of handling.

You can also determine how far out of parallel, spur gear teeth are with reference to the gear axis. One manufacturer of hydraulic pumps found the teeth of spur gears he had been using from .002" to .0025" out of parallel with the axis.

The Red Ring Lead Comparator will also show you how much heat distortion

there is along a gear tooth on hardened gears. Also the position and amount of crowning on crowned tooth gears. Two indicators are used so that either side of the tooth may be investigated without changing the indicator mounting. The lead drum is arranged to accommodate numerous leads thus facilitating rapid change-over from one job to another.

The Red Ring Machine is not expensive initially or expensive to operate. In two models it handles gears up to 24" O.D. and 10" between centers. Write for descriptive bulletin.

**NATIONAL BROACH AND MACHINE CO.**  
5600 ST. JEAN • DETROIT, MICHIGAN

Patents issued and pending No. 2,026,784

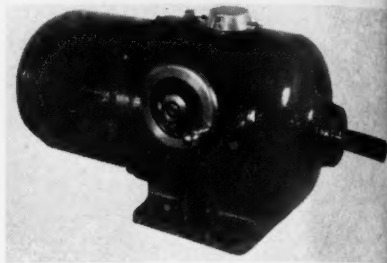
in overall height and has a stroke of 24 in. It has operating speeds of 83 in. per minute power stroke and 157 in. per minute return stroke. The table of the press is 30 x 22 in.; the gap, 25 in., and the reach, 15 in. The distance from the table to the floor is 40 inches.

### "Lenney" Redesigned Variable Speed Transmission

The illustration shows the extensively redesigned, infinite, variable speed transmission which has been brought out by The Lenney Machine & Mfg. Co., 733 Niles Rd., Warren, Ohio. The transmission, when driven by a 1,750 r.p.m. motor, has a speed range of from 225 to 925 r.p.m. and is equipped with an automatic pressure-regulating clutch of simple and rugged design which is actuated by the amount of load at the output shaft. The gearing construction of the transmission has been redesigned so as to provide quieter operation and to reduce vibration. In addition, all thrust in the cross shaft and bearings is said to be practically elimi-

nated due to the change in design.

A speed indicator dial conveniently located on the top of the "Lenney" Variable Speed Transmission permits the operator to select speeds accurately.



"Lenney" Redesigned Variable Speed Transmission

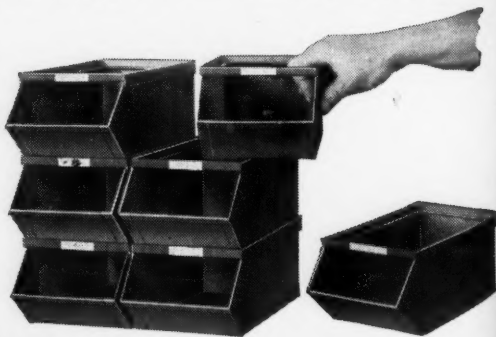
Precision ball bearings are used throughout. Oil is sealed within the case, and thorough lubrication is ensured by the splash method. The output and cover of the unit has also been redesigned to conform to the streamline principle.

## TRIPLE SAVINGS

with Individual Stackbins

# TIME - SPACE - LABOR

Hundreds of plants report savings that mean lowered costs...increased efficiency...bigger profits. Compact, sturdy Stackbins keep small parts and loose materials instantly accessible. Patented Stackbins have full-width hopper fronts and perfectly smooth interiors to speed up handling and cleaning.



## STACKBINS

"STACKED AND STILL ACCESSIBLE"

Try individual Stackbins wherever you have a problem of storing or handling parts and materials. A letter from you will bring full details and low prices. Stackbin Corp., 53 Troy St., Providence, R. I.

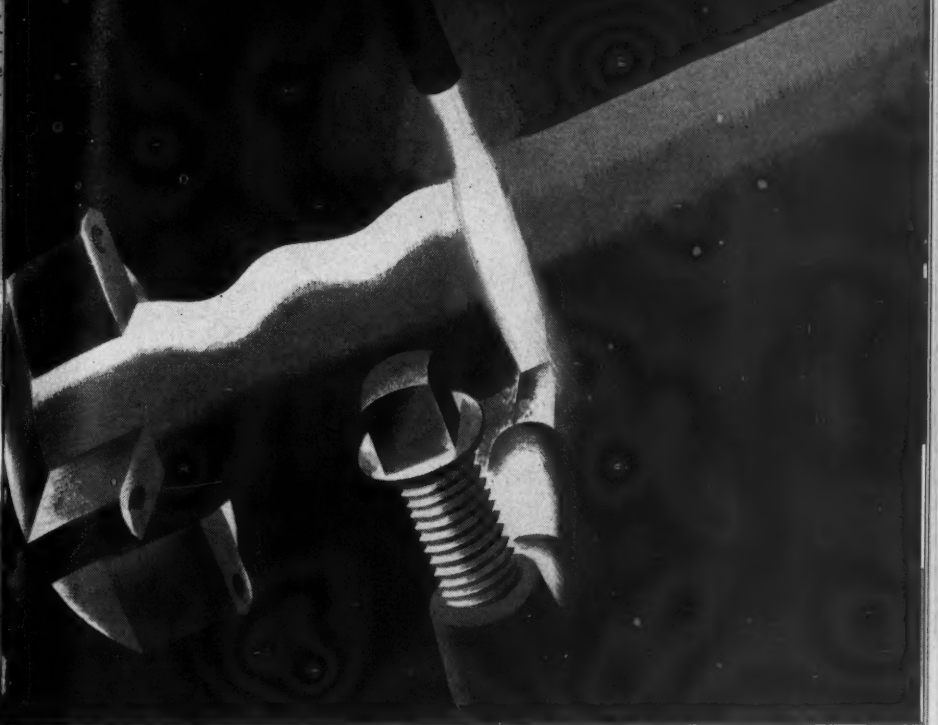
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## DOUBLED SERVICE—HALVED COST

Designers today, employing modern materials, are frequently able to satisfy requirements formerly considered mutually exclusive. A case in point: fishing spear bodies, used in oil well drilling, must be strong and have a high degree of hardness to resist abrasion. The latter quality made them costly to machine—until the manufacturer adopted Nickel-Chrome-Molybdenum (SAE 4340) steel.

This steel is heat treated to a high degree of combined toughness, fatigue strength and hardness (375-400 BHN). But what, in this case, proved especially

important, it can be so readily machined at the specified hardness that the tools used last about twice as long as formerly, thus halving the tool cost.

This instance of Nickel-Chrome-Molybdenum meeting the double requirement of high serviceability and low fabrication cost is typical of the results achieved by the employment of modern materials. Rechecking your own specifications may disclose similar opportunities. Our helpful booklet, "Molybdenum in Steel," will be sent free on request to engineers and production executives.

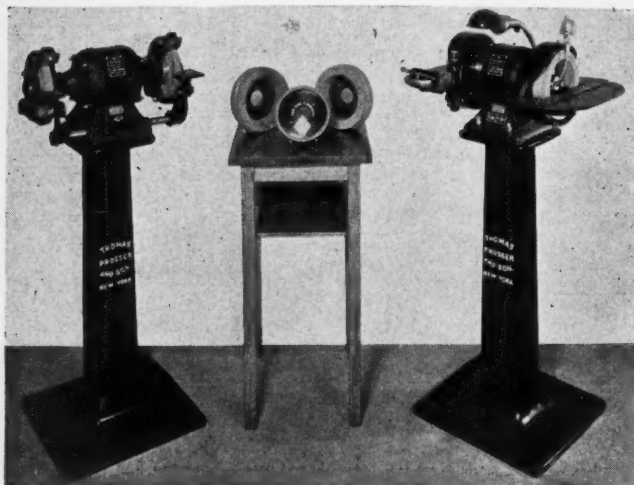
PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

**Climax Molybdenum Company**  
**500 Fifth Avenue New York City**

# MOLY

## Prosser Carbide Tool Grinding Setup

A tool grinding setup that is said to be ideal for the complete reconditioning of single point tools such as cemented carbide, stellite, or high speed steel



Prosser Carbide Tool Grinding Setup

single point tools is announced by Thomas Prosser & Son, 120 Wall St., New York, N. Y. The setup, as shown in the illustration, consists primarily of two cemented carbide tool grinders, one for use in roughing down the chipped or badly worn tools and the other for use in fine finishing the tools. The grinder used for roughing purposes (shown at the left) is equipped with a coarse straight vitrified wheel on one

end and a rough open-grained straight silicon carbide wheel on the other end.

The grinder used in finishing (shown at the right), which is of the table type, has a silicon carbide cup wheel on one end and a fine finishing wheel on the other end. Due to the unusual construction of the pivot-point and its location

in the same plane as the surface of the wheel, the tables of this grinder, it is said, can be almost instantly adjusted to any angle desired and, in addition, remain rigidly fixed in the desired position until readjusted. A gage is used to indicate the angle of the tables.

The motors of the Prosser Cemented Carbide Tool Grinders are reversible so that either right or left-hand tools can be ground with the wheel rotating toward the cutting edge. On the grinder at

the right in the illustration, a simple effective brake is provided for stopping the machine when the direction of rotation is to be changed. In addition, the grinder is equipped with a coolant-feeding device for supplying the diamond wheels with oil or water. Either the resinoid or the new metal bonded diamond wheels can be used on the ends of the grinder.

An additional piece of equipment on

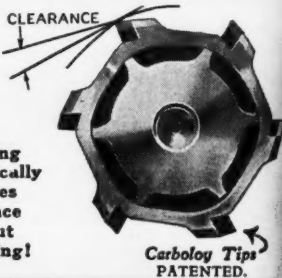
## No Other Reamer Saves You This!

Staples reamer eliminates regrinds after re-sizing. Provides parallel and equal outward expansion of tips, free cutting action and long life. Customers report as many as 30,000 smooth accurate holes in low carbon steel without resharping. Write for leaflet. Sold thru Carbology Co., or direct from—

STAPLES TOOL & ENGINEERING CO.  
Cincinnati, Ohio

# STAPLES

Re-sizing  
Automatically  
Provides  
Clearance  
Without  
Regrinding!



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# Dumore PRECISION Grinders

## All the Precision of a Naval Maneuver

an of battle or plan of production...both  
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the reduction of spoilage...the ready  
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any grinding problem and a demon-  
ation of any Dumore tool, right in your  
m plant.

THE DUMORE CO., Dept. 180-E, Racine, Wis.



Dumore  
No. 44  
"Toolmaker"

### Only DUMORE Gives You ALL of These

- Lightweight for easy portability...yet sturdily built for long life.
- Spindle speeds up to 42,500 r.p.m....without vibration.
- Wide selection of internal and external quick-change quills.
- A size of grinder for every job...15 models to select from.
- A background of 25 years' precision grinder specialization.
- Top ranking distributors conveniently located for quick service.

the grinder permits either the silicon carbide or diamond wheel to be adjusted along the shaft to compensate for wear and to keep the face of the wheel as close to the edge of the table as desired. In this manner, small tools can be ground using the silicon carbide wheels down to the metal plate on which they are mounted. A combination tool-angle protractor and truing tool holder is said to permit accurate grinding of tools and to hold a diamond in correct position for properly dressing the surface of a wheel.

### "Kalamazoo" Type W Wide Swing Grinder

The illustration shows a wide swing grinder, designated as the Type W, which has been added to the line of "Kalamazoo" grinders manufactured by the Hammond Machinery Builders, 1615 Douglas Ave., Kalamazoo, Mich. Designed for heavy-duty service, the grinder is powered by means of a 3 h.p., totally-enclosed motor and is equipped with 14-in. boiler plate guards spaced

36 in. between wheels. The spindle operates on four ball bearings.

The Kalamazoo Type W Grinder is



"Kalamazoo" Type W Wide Swing Grinder

said to be especially useful on bulky work or any application where extra working space around the grinding wheels can be used to advantage. Net weight of grinder, 915 pounds.



A No. 2 B & S Milling Machine equipped with Schultes 4 Speed Drive.

## 4 SPEEDS FOR ANY JOB

on Milling Machines, Shapers, Lathes, Drill Presses, Planers, Punch Presses, Slotters, etc.

The SCHULTES 4-Speed Drive operates each tool at the best speed for the job . . . with finger-tip control.

Schultes-equipped machines are independent units that can be located at the most advantageous points on production lines.

All moving parts enclosed . . . no bolts to change by hand . . . fast . . . flexible . . . economical.

Write for further details.

**WESTLOF TOOL & DIE CO.** 430 Bellevue Ave. Detroit, Michigan



Grinder is



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(1940)

# Bridgeport

## TURRET MILLING MACHINE

Flexibility  
Rigidity  
Unparalleled  
Range

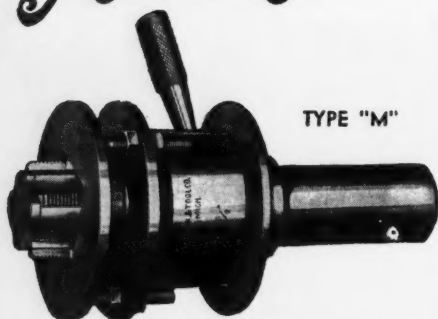
AN outstanding product weighing 1600 lbs. with unusual range for large tool and fixture work yet extremely sensitive for fine milling on molding dies.

Also, high speed milling attachments for all makes of milling machines.

Write for further details.

BRIDGEPORT MACHINES, INC.  
2 REMER STREET · BRIDGEPORT, CONN.

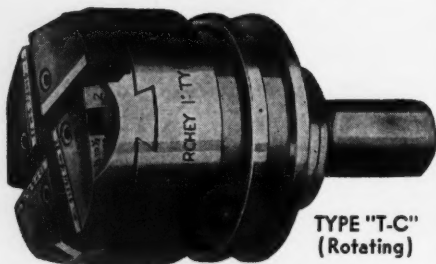
# Murchey



TYPE "M"

## Collapsible MACHINE TAPS

Universal machine taps used as a stationary tap with handle or as a rotating tap by removing handle.



TYPE "T-C"  
(Rotating)

(Also in Non-Rotating Type T-G)

## Tangent Chaser DIE HEADS

Designed to use tangential chasers, these rotating heads will cut extremely accurate threads on long production runs.

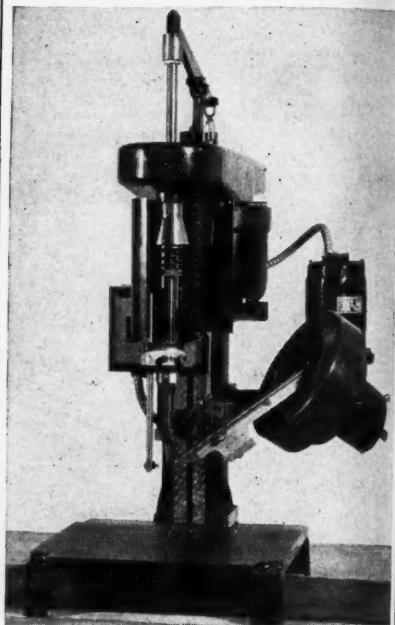
WRITE FOR DETAILS

**MURCHEY MACHINE & TOOL CO.**  
**DETROIT MICHIGAN**

"ALL STYLES OF BOLT AND  
PIPE THREADING MACHINES."

## Detroit Model A Magazine Feed Power Screwdriver

Designed to drive small screws ranging from No. 2 to No. 6 and from  $\frac{1}{8}$  to  $\frac{3}{8}$  in. in length, the Model A magazine feed power screwdriver shown herewith has been developed by the Detroit Power Screwdriver Co., 5375 Rohm



Detroit Model A Magazine Feed Power  
Screwdriver

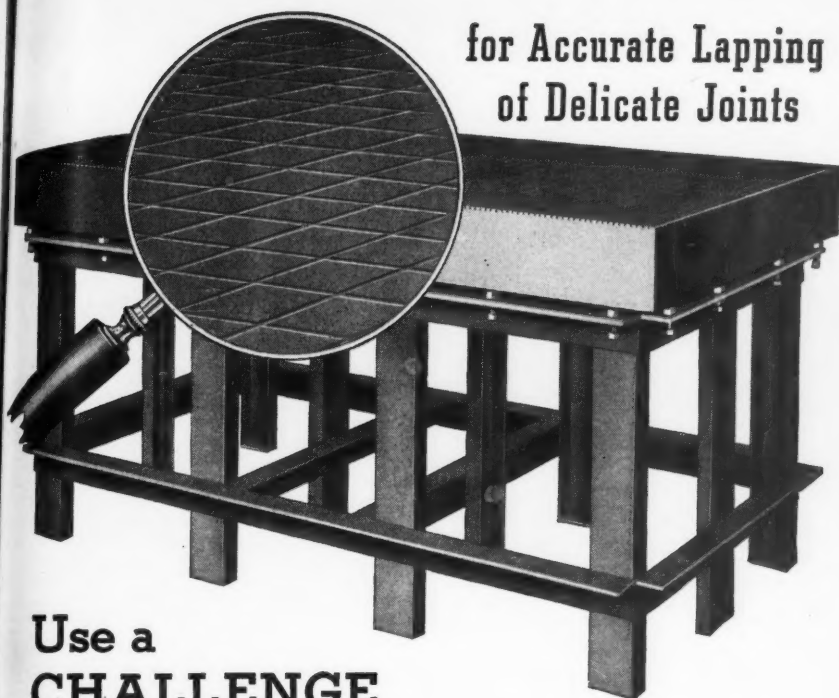
Ave., Detroit, Mich. The machine is sturdily constructed for long life and is equipped with a sensitive spindle clutch. The hopper is driven by an individual motor unit to provide a constant hopper speed regardless of spindle speed.

The Model A power screwdriver is designed so that it can be placed over a 12-in. conveyor belt and is operated by means of a foot treadle fastened to the floor. All adjustments are readily accessible, and the screws are in constant sight of the operator. Tension to which screws are to be driven is controlled by a simple adjustable locknut on the lower spindle.

Feed

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rom  $\frac{1}{16}$ "  
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the De-  
Rohns

for Accurate Lapping  
of Delicate Joints



## Use a **CHALLENGE** *Semi-Steel* LAPPING PLATE

● This plate is specifically designed to assure a perfect fit when lapping in metal joints on which no gaskets, shellac or other sealer is used. It has  $\frac{1}{16}$ " grooves, spaced  $\frac{1}{2}$ " apart, running the full length and width of the dependably accurate surface. Made of the finest semi-steel, specially heat treated and carefully machined. Sizes from 8x8 to 54x144 inches. Arc-welded, all-steel stand is optional.

**THE CHALLENGE MACHINERY CO. • GRAND HAVEN, MICHIGAN**

CHICAGO, 17-19 E. Hubbard St.



200 Hudson Street, NEW YORK

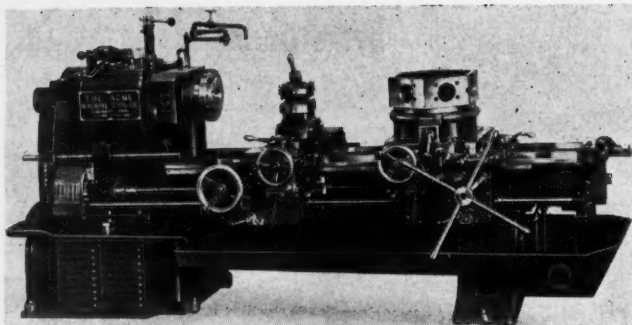
375



**FREE CATALOG**—Illustrates and describes Challenge Time- and Labor-Saving Devices for Tool and Machine Industries.

Name

Full Address



Cincinnati Acme 1S  
25-In. Swing Universal  
Turret Lathe

The Detroit Magazine Feed Power Screwdriver is available in three models designed to drive screws from No. 2 to  $\frac{1}{2}$ -in. cap screws and in lengths up to  $1\frac{1}{4}$  inches.

### Cincinnati Acme 1S 25-In. Swing Universal Turret Lathe

Illustrated herewith is a universal turret lathe built for 25-in. swing over

larger machines are ordinarily offered. In operation, the No. 1S machine requires no more effort than the smaller sizes of Acme turret lathes.

The machine has a pyramid-type non-overhanging headstock, cast integral with the bed. The bed is of rigid construction, well braced and cross-ribbed throughout its entire length. Hardened and ground one-piece steel vees are used.

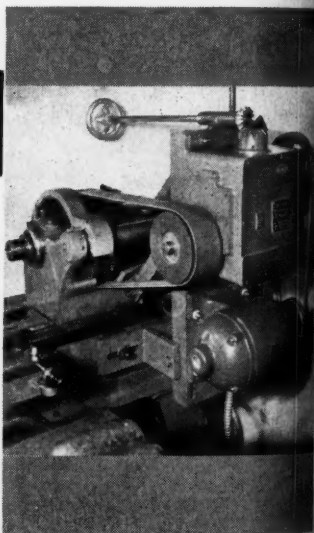
The spindle operates in triple roller bearings and has a safety latch to pre-

the carriage wings which has been brought out by The Acme Machine Tool Company, Cincinnati, Ohio. The machine is designed to handle chucking work of large diameter for which much

## *Modernize with* **FLEXOID** SPEED CONTROL

### A Revolutionary 4 Speed Control Unit

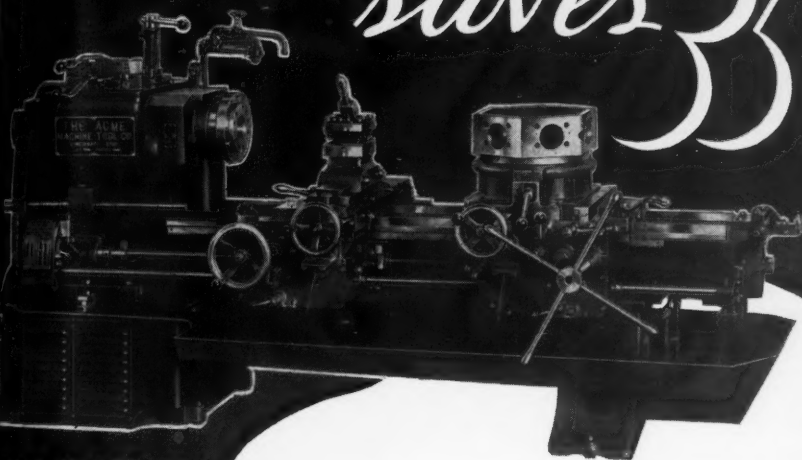
The Flexoid 4 speed control combines all the advantages of motorized control for machine tools in one compact, fool-proof, self-contained unit. A single hand control — at remote position if desired — operates all ratios with neutral position between changes. All hardened gears... ball bearing... parallel input and output alloy shafts... rigid, solid construction... all housed in one case... motor mounted on unit. Write for descriptive data and prices.



## The Smith Power Transmission Co.

410 LAKESIDE AVE., N. W., CLEVELAND, OHIO

# Easy handling saves 35%



**NO. 1-S-25"  
CINCINNATI  
ACME  
UNIVERSAL  
CHUCKING LATHE**

## **SAVINGS in Operating Costs . . .**

The No. 1-S, 25" CINCINNATI ACME is designed for easy handling of large diameter medium duty chucking work that would ordinarily require a large heavy duty and more cumbersome machine.

A leading valve manufacturer reports 35% savings in his manufacturing costs.

The production value of this CINCINNATI ACME has been proven in shipyards, Navy yards, valve shops and other manufacturing plants.

Swings: 27" over bed; 25" over carriage wings; 19" over cross slide.

WRITE FOR BULLETIN G-103.

**THE ACME MACHINE TOOL COMPANY**  
**CINCINNATI OHIO**

vent accidental starting. Twelve spindle speeds are available, supplying a speed range of from 15 to 500 r.p.m. Headstock gears are of hardened alloy steel, and are shaved and lapped. All shafts are mounted on tapered roller bearings. An oil pump supplies oil to the spindle bearings, headstock gears and shafts.

The carriage is of the bridge type, taper gibbed to both vees and between the apron and lower front side of the bed. The cross slide is taper gibbed to an inverted dovetail. Adjustable twin radial thrust bearings and adjustable twin nuts are provided for the cross feed screw. Bed ways are lubricated by a one-shot system.

Either fixed center or cross sliding hexagon turret can be supplied. The turret revolves on a tapered roller bearing and is clamped by means of a large double tapered circumference binder. Anti-friction bearing aprons are provided for both carriages with 12 complete independent and reversible feed changes in each apron. Clutches are of the sawtooth type, lubricated by pressure.

The swing over the bed is 27 in. and over the cross slide is 19 in. Cross

travel of the carriage is 10 in. and longitudinal travel is 41 in. Twelve feeds, either longitudinal or cross, are provided, the longitudinal feed range being 0.005 to 0.200 in. and the cross feed range being from 0.002 to 0.100 inch.

The hexagon turret is 16½ in. across the flat. The cross sliding turret has a cross travel of 7½ in. Longitudinal travel of either turret is 41 in. The feed ranges are the same as for the carriage. Maximum distance from turret face to spindle nose is 53 inches.

Power is supplied by a 7½ or 10 h.p., 1,200 r.p.m. motor. Floor space required, 4 ft. 6 in. by 11 ft. Weight, 7,160 pounds.

## Wiedemann Type R-8 Motor Driven Turret Punch

The Wiedemann Type R-8 Motor Driven Turret Punch shown here, designed for economical production of small lots, has been brought out by Wiedemann Machine Company, 1815 Sedgley Ave., Philadelphia, Pa. The machine has a 54-in. throat with a turret having 12 to 32 stations. Equipped

# LIGHT Where You Need It

... Any Position ... Any Angle ... At A Touch



Above illustration suggests the unlimited flexibility of Dazor Floating Lamps by showing a few of the innumerable positions obtainable.

The Dazor Floating Lamp may be instantly swung into any position and "stays put" without adjustment or locking. Gives localized lighting without glare. No eye-strain. Greater efficiency at lathes, drills, presses, shapers, milling machines, and all bench work.

Five types of bases available for attaching or clamping to machines, benches, drafting boards, desks, busi-

ness-machine tables, etc. Also portable pedestal type.

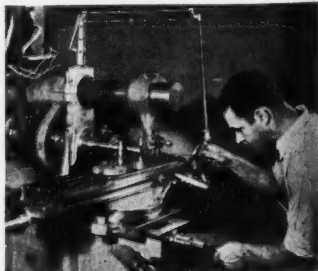
Distributed by appointed electrical wholesalers. Call your supplier or write us for distributor's name and descriptive literature.

**DAZOR MANUFACTURING CORPORATION**  
4483 Duncan Ave., St. Louis, Mo.

## Dazor Floating Lamps

Fluorescent and Incandescent

Y-1





# Less Tap Breakage More Accurate Tapping

WITH NEW "PROCUNIER" HIGH SPEED TAPPING HEADS  
AND THE "TRU-GRIP" TAP HOLDER



Weighing less than one-third of the conventional tap holders, compact and accurate — the new Procunier TRU-GRIP tap holders practically eliminate tap breakage and permit new standards of accuracy in tapping. New plant records for economy and accuracy are being made with this latest type improved tap holder — together with the Procunier High-Speed Tapping Heads which alone offer all these features: Dry, double-cone friction clutch that won't wear and can't absorb oil; makes bottom tapping easy; ball bearings; three point balanced, heat-treated gear reversing mechanism, which distributes pull and greatly reduces strain—and other important features.

## SEND FOR BULLETIN

giving full details, description and prices on complete line of Procunier Precision Tapping Heads to meet all needs, the new TRU-GRIP Tap Holder —and also the full line of Procunier Universal Tapping Machines, hand, foot or air-operated.

Procunier Safety Chuck Co.  
12 S. Clinton St., Chicago, Illinois

Send me Bulletins on: ☐ High Speed Tapping Heads ☐ Tru-Grip Tap Holders  
☐ Universal Tapping Machines

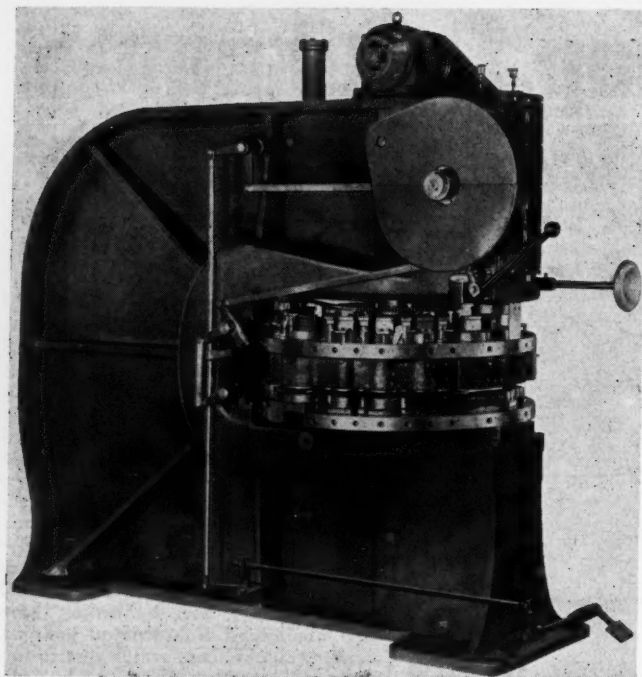
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# PROCUNIER

**SAFETY CHUCK CO. 12 S. CLINTON ST. CHICAGO • ILLINOIS**



Wiedemann Type R4  
Motor Driven Turret  
Punch

The turret is mounted on ball bearings with hardened and ground index bushings. Index pins are hardened and ground, and are located at the rear of the turret.

The frame is a single semi-steel casting with all bearings integral and bronze bushed. Crankshaft and ram bearings are in a solid box section with cover plate in front for easy access. The high carbon steel crankshaft is of the eccentric type and of ample diameter with full diameter bearings.

with a special table which is also available, the machine will space holes in sheets up to 50 in. wide, 100 in. long, and  $\frac{1}{8}$  in. thick. Capacity is a 5-in. diameter hole in  $\frac{1}{8}$ -in. mild steel, equivalent to 2 sq. in. of shearing.

The turret is 52-in. diameter with 12 to 32 stations on 42-in. centers, the upper and lower turrets geared together and locked in position by a patented method for exact alignment. Operation is either by handwheel or motor drive.

The clutch is of the jaw type with renewable hardened steel faces. It locks mechanically until the turret is properly indexed and locked. Ram and punch holders are heat treated chrome vanadium steel and punch holders are readily removable to facilitate changing punches. Punches and dies are of high carbon tool steel, hardened and ground.

Standard stroke is 1 $\frac{1}{2}$  in., but can be varied to suit. Standard clearance between dies and strippers,  $\frac{1}{8}$  in., but can

# "OUTWEARS

## the best

# Bronze Metal"

20 years



without  
a drink

## ARGUTO

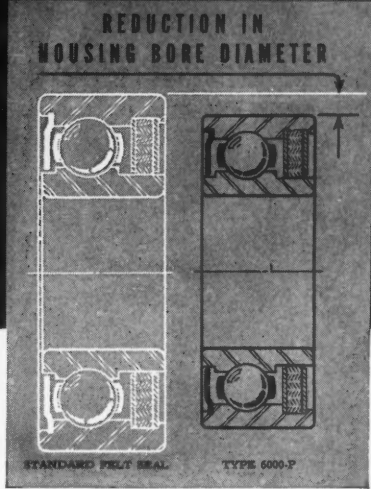
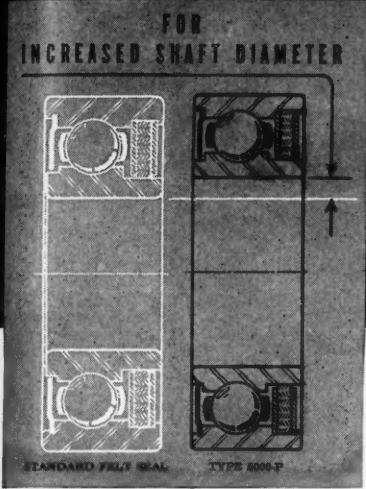
OILLESS BEARING CO.

Wayne Junction, Philadelphia, Pa.

# for LIGHTER AND MORE COMPACT UNITS

*use this new*

## EXTRA LIGHT FELT SEAL BALL BEARING



This NORMA-HOFFMANN "6000" SERIES BALL BEARING meets the needs of manufacturers of portable tools and other small high-speed units in which minimum weight is sought, center distances are restricted, and designers are cramped for space.

From the illustrations, note that the lighter proportions of the new "6000" Series permit a larger shaft in a housing

of fixed diameter, or a smaller housing for a shaft of given diameter, than any standard light series felt seal bearing.

Observe also that the thick, closely-fitting, removable (Patented) felt seal is wholly within the confines of the bearing itself and therefore not exposed to injury. The wide, solid inner and outer rings make housing inserts unnecessary. Grease capacity is ample for long periods of service.

The "6000" series is furnished with single felt seal and the "6000-P" series with felt seal and metal shield; available also are "6100" (unshielded), "6100-P (with one metal shield) and "6100-PP" (with two metal shields) series which are slightly narrower in width. Write for data sheet. Let our engineers work with you.

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A

## NEW KNURLED BLACK DOME ON PLAIN RENEWABLE

# Bushings



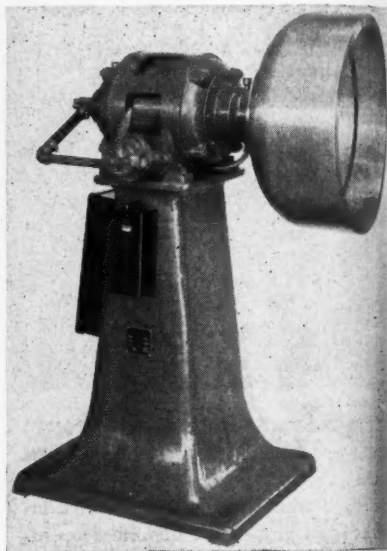
Universal black-domed plain renewable drill bushings are now available with knurled head, making them easier to handle, easier-to-remove. Bores are super-finished, straight and round within .0001. All Standard sizes available. Write for facts.

**UNIVERSAL**  
Engineering Company  
Frankenmuth, Mich.

be varied to suit. Strokes per minute 100. Motor required for main drive, 3 h.p. at 1,800 r.p.m. Motor required for turret operation, ½ h.p. at 1,800 r.p.m. Revolutions of turret, 6 per minute. Drive is by V-belts to flywheel. Floor space required, 10 ft. 6 in. long by 4 ft. 3 in. wide.

## Schauer Unit with Vacuum Chuck

Illustrated herewith is a Schauer Standard Speed Lathe equipped with a specially designed vacuum chuck in



Schauer Speed Lathe Equipped with Vacuum Chuck for Holding Finely Finished Work While Polishing

which work can be chucked without danger of scratching. The machine is a product of Schauer Machine Company, 2060 Reading Road, Cincinnati, Ohio. The chuck shown was designed especially for holding stainless steel bowls, 22 in. in diameter and 10 in. deep, so that the bowls could be polished to a mirror finish. Both the inside and outside surfaces of the piece are polished on one lathe. the vacuum

SEVERANCE TOOL MFG. COMPANY  
EAST GENESEE AVENUE • SAGINAW, MICHIGAN



# Severance

## MIDGET MILLING CUTTERS

ATTENTION: Mr. Rotary File User  
SUBJECT:  $50\% + 100\% + 400\% = \text{Savings worth while.}$

Gentlemen:

Do you know that TWO men can easily do the work of THREE when you give them GROUND CUTTERS to replace hand cut or mill cut rotary files?

Cut 50% faster...

Miller buys 100% more...

last 400% longer...

Have you discovered that it only costs 45¢ or less to RE-GROUND a Midget Milling Cutter of the same size and shape as a hand cut rotary file for which you would pay 84¢ to \$1.19 each net?

Has it occurred to you that the re-ground Midget Milling Cutter will last five times longer on the same work as the hand cut rotary file and will continue to do so each of the dozen or more times it can be reground?

If not, you will readily see that un-dreamed-of savings are ahead for you. In another month or two you can easily cut your rotary file budget down to 25% or possibly to only 10% of it's present level.

These H.S. Cutters can be obtained in every known rotary file shape and GROUND-from-the-solid after hardening with just the cut best suited to your kind of material.

We offer complete grinding and re-grinding service for all makes of rotary files and burs; and, as originator of GROUND H.S. Rotary Files, we also maintain the world's largest stock in the widest variety of shapes and range of sizes.

Yours for c-u-t-t-i-n-g c-o-s-t-s,

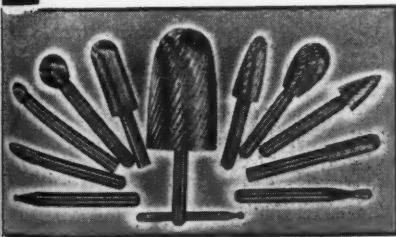
SEVERANCE TOOL MFG. CO.

*R.M. Severance*

R. M. Severance

P.S.- We will be pleased to demonstrate the truth of the foregoing without obligation if you will allow us to submit some of our standard cutters for trial.

---Ask for catalogue No. 12.---  
ST Mfg. Co.



### SEVERANCE TOOL MANUFACTURING CO.

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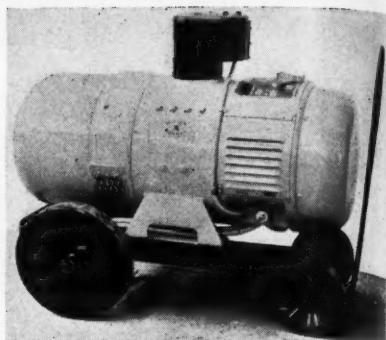
SAGINAW, MICH.

chuck making it possible to chuck the piece, process it, and remove it with ease, speed, and precision and without running any risk of scratches or abrasion on the workpiece. The saving in time, elimination of spoilage, and improved quality of workmanship are accompanied by maximum safety for the lathe operator.

The machine is provided with either single or two-speed motor, of 1 or 2 h.p. depending upon the work to be handled. An automatic braking system stops the motor in two seconds from high speed. A thermal switch and overload relay are standard equipment.

### Type SC Remote Control Device for Wilson "Hornet" Arc Welder

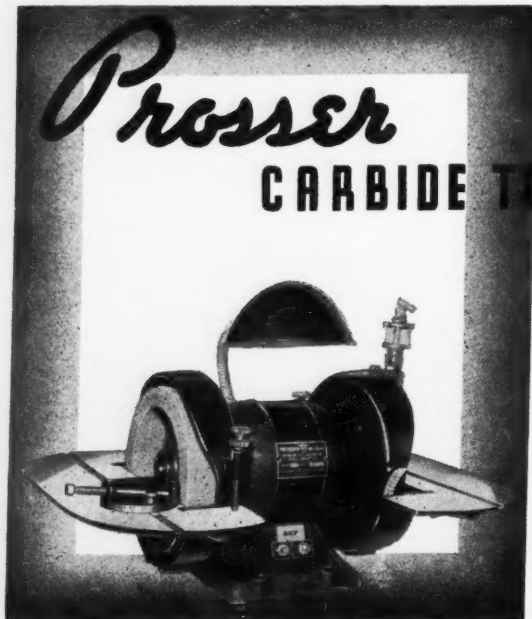
A device for the remote control of Wilson "Hornet" arc welders, designated as the Type SC, has been announced by the Wilson Welder & Metals Co., Inc., 60 E. 42nd St., New York, N. Y. The single control of the "Hornet" is said to be well adapted to opera-



Wilson "Hornet" Arc Welder with Type SC Remote Control Device

tion by the remote control method. To utilize the Type SC device, the hand-wheel which governs the control pole of the standard welder is simply replaced by the reversible motor-driven remote control unit.

Claimed to cover the entire range of the machine to which it is attached in both high and low settings, the Type SC remote control device permits mi-



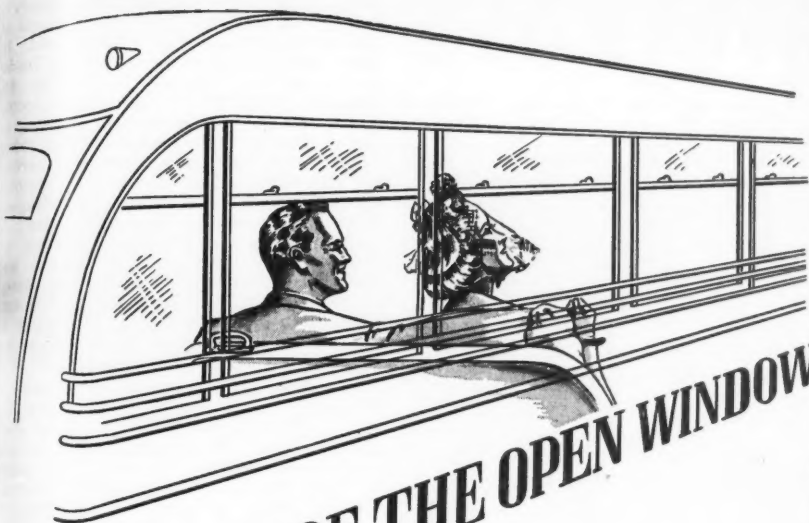
- Removes metal fast when rough grinding.
- Finish grinds smooth keen cutting edges.
- This grinder will quickly pay for itself by increased tool performance and life between grinds.

**\$97.50**

**10 DAYS FREE TRIAL**  
Write for complete details

**Thomas Prosser & Son**  
**120 WALL ST. NEW YORK**

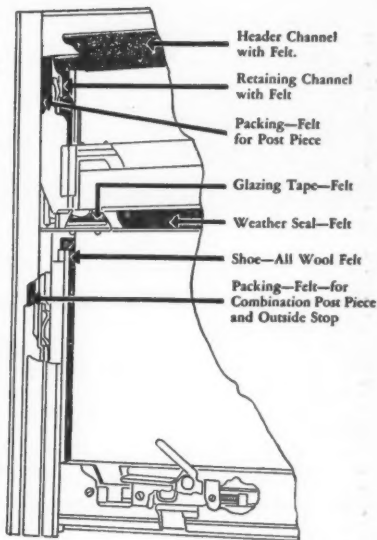




# THE CASE OF THE OPEN WINDOW!

IN the olden days, an open window in a bus or train was a problem to close. Passengers suffered many discomforts because of the well known inability of these windows to be opened and closed easily. The National Lock Washer Co. then produced a window that did away with these objectives, as well as a window that effectively sealed out the cold and dust. As integral parts of this window the National Lock Washer Co. chose FELTERS CERTIFIED FELT to aid in making the window easier to open and weather proof.

We'll put our time and engineering against your inquiry to find out if certified felt may be used advantageously in your product. Why not drop us a line?



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MODERN MACHINE SHOP 177

Type 80

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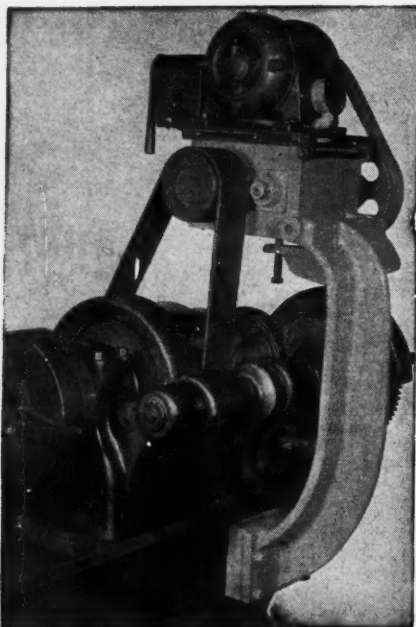
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May, 1940

## MOTORIZATION DRIVES



(Fig. 198)

### 5 H.P. 1136—5 H.P. 4 Speed Gear Box

No one drive meets **all** requirements advantageously.

Be sure to choose the correct type for **your** application.

We offer:

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nute adjustments in current output by merely touching one of two contacts on the electrode holder to the ground. In other words, when the electrode holder button marked "more" is brought into contact with the ground, the electric motor in the remote control housing on top of the machine revolves and raises the control pole core, thereby increasing the output. The motor revolves only while actual contact is maintained. When the button marked "less" is grounded, the remote control motor revolves in the opposite direction and lowers the control pole core, consequently decreasing the output. The contact buttons are shaped differently so that the operator can easily locate the correct one even in poor light.

The 1/80 h.p. electric motor, which is all that is required to operate the control pole, is protected by two limit switches and by a slip clutch to prevent damage when the end of the range of operation is reached. The generator can be preset by push buttons mounted on the control.

## Landmaco Threading Machine for Threading Rock Bit Steel or Rods

Unusual flexibility is the feature of the equipment shown in the illustration which consists of a Landmaco Threading Machine arranged especially for reconditioning and threading drill steels or rods. The machine, product of Landis Machine Company, Waynesboro, Pa. employs a three-jaw universal chuck instead of the conventional Lanco revolving-type head and the die head is mounted on a special carriage, the de-

## PORTER cutters

**BOLT CLIPPERS** — precision built with special heat treated jaws and minimum friction loss. All sizes with capacities up to 3/4" annealed bolts in thread or 1/2" rod. Straight, angular, or end cut. Swivel heads to cut at various angles. Write for free catalog and metal cutting instruction book.



H. K. PORTER, Inc., Everett, Mass.

# STOP

**Loss of Fingers,  
Hands and Arms  
— Prevent Wrecks  
of Die, Die Set or  
Press . . .**

*with Danly Safety Guide Post Covers*

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MAKERS' SUPPLIES FROM  
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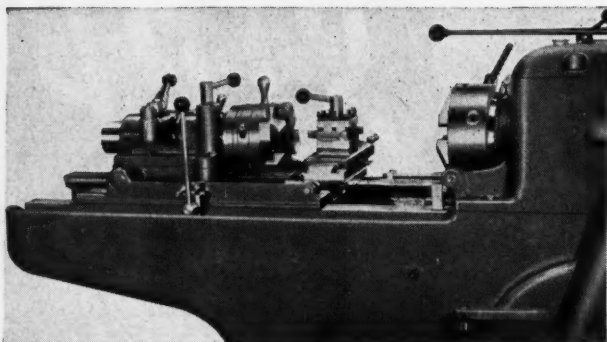
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**DUCOMMUN METALS AND SUPPLY CO. • Los Angeles • San Francisco**

**DANLY PRECISION DIE SETS**

# DANLY DIE SETS and DIE MAKERS' SUPPLIES



Landmaco Threading Machine Arranged for Threading Rock Bit Steel or Rods

sign of which incorporates many unusual features.

The carriage is equipped with a tailstock into which is fitted the shank of a Landmatic head. The shank is especially long and is made to a sliding fit within the bore of the tailstock, permitting linear travel of the head. The die head can be extended to its most advanced position in the tailstock and rigidly clamped for thread cutting operations. All thread cutting operations

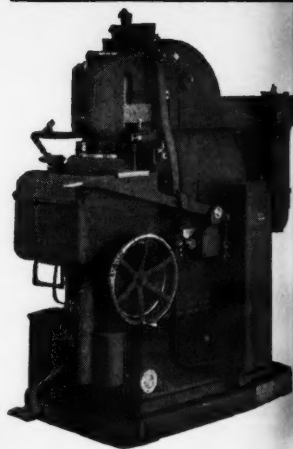
ing, facing, forming, and cutting off tools. Since the Landmatic head is of the pull-off type, provision is made for stopping the forward movement of the carriage. The stop is adjustable; thus it can readily be synchronized with the lead screw tripping mechanism so that both actions will take place simultaneously, assuring the production of threads of uniform length and permitting threading close to a shoulder.

## WALKER

### IMPROVED ROTARY SURFACE GRINDER

Raising or lowering wheel head automatically starts or stops the table and magnetizes or demagnetizes 12" magnetic chuck. Other features include wheel head locking device and adjustment of upper portion of column for grinding saws, cutters, etc., having hubs up to 6" diameter. Six table speeds are available and a foot brake facilitates quick stopping of table.

**O. S. WALKER COMPANY, INC.**  
WORCESTER • MASS.



Threading  
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# COVEL-HANCHETT

*Presents*

No. 10

## Metal Saw Sharpener

### Features --

Full automatic grinding of  
slitting and milling saws 2  
to 10 inches in diameter.  
Grinding by cam control  
or plunge cut method. In-  
dex plate feed.

Grinding wheel carried on  
ball bearings. Grinding  
head pivots on Timken  
bearings. Hand wheel con-  
trol for adjustment of feed  
and depth of tooth.

**Secure . . .** Extreme accu-  
racy and full production  
from your saws.

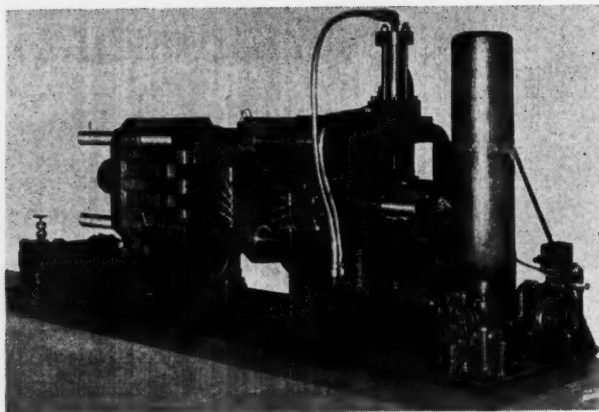
The Covell Hanchett Com-  
pany have available a  
complete line of automatic  
metal saw sharpeners for  
saws from **2" in diameter**

to 120" in diameter. Write for full details on the correct  
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# COVEL-HANCHETT CO.

BIG RAPIDS

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**G & M High-Pressure Hydraulic Die-Casting Machine for Zinc, Tin and Lead-Base Alloys**

## G & M High-Pressure Hydraulic Die-Casting Machines

The G & M Manufacturing Co., Cleveland, Ohio, has developed two greatly improved high-pressure hydraulic die-casting machines, one for zinc, tin, and lead-base alloys, and the other for

aluminum, brass, and magnesium alloys. Similar in engineering and construction, the machines are designed to accommodate larger dies, increase production and reduce waste, give a tighter seal on dies and largely eliminate flash, and, generally, facilitate the die-casting process.

The base, framework, die plates, and toggle links are made of solid steel plates, flame-cut and welded. Welding has been substituted for bolting and riveting wherever possible. The result is a type of die-casting machine which is said to be heavier and stronger than any previously manufactured by this firm and more capable of withstanding

*Are you making Big Welding Profits?*

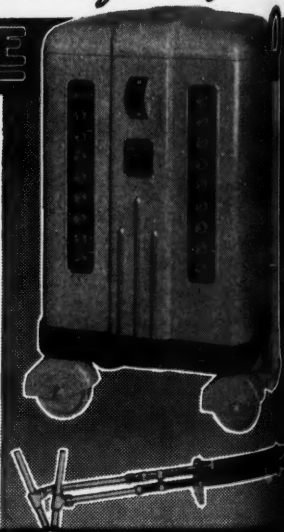
**YOU CAN WITH MARQUETTE**

## THE WORLD'S LARGEST SELLING A.C. ARC WELDER

**Because:** All metallic arc welding jobs naturally cost less when you do them with a moderately priced welder (\$98 to \$498) which is built to give a great many years of hard service (heavily insulated, scientifically designed transformer) and has no moving parts to wear out. In addition the Marquette employs all the advantages of alternating current such as the elimination of "magnetic blow" thus assuring sound, strong ductile welds. Because the Marquette cuts out costly failures and is far cheaper to operate than comparable D.C. or gas machines, it can save you a lot of money. Eight models at eight low prices... a size and price to fit your needs.

## MARQUETTE ARC TORCH

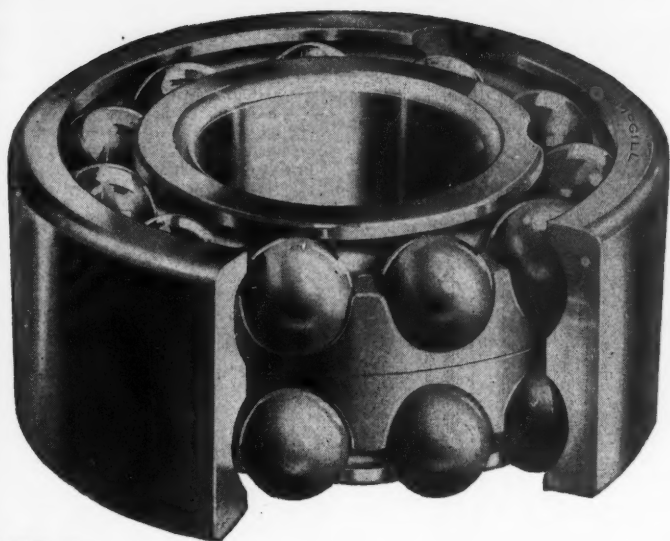
Add a Marquette Arc Torch to your Marquette A.C. Arc Welder (or any other A.C. welder) and you will save a great deal of the cost of jobs formerly requiring much more expensive methods. Big savings from soldering, non-ferrous welding, preheating, brazing and many other jobs done by an independent source of heat can all be yours for only \$24.75.



**MARQUETTE MANUFACTURING CO., INC.**

**MINNEAPOLIS, MINN.**





**McGILL . . .**

**MAXIMUM CAPACITY BEARINGS**

*... for greater combined  
radial and thrust loads*



The greater number and size of balls supporting the races increases load possibilities in the new McGILL Maximum Capacity Double Row Ball Bearing. This new construction is ideally suited for heavy radial or thrust loads or any combination of such loads. A McGILL Bronze Retainer in two sections allows for independent rotation of the two rows of balls—important under severe operating conditions.

Send now for descriptive Bulletin.

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*Reduce Your Die Costs with*

# HY-TEN "M" TEMPER ALLOY STEEL

● .70 Carbon Cr-Ni-Moly  
Oil Hardening.

**Rounds, Squares, Flats  
for Immediate Shipment.**

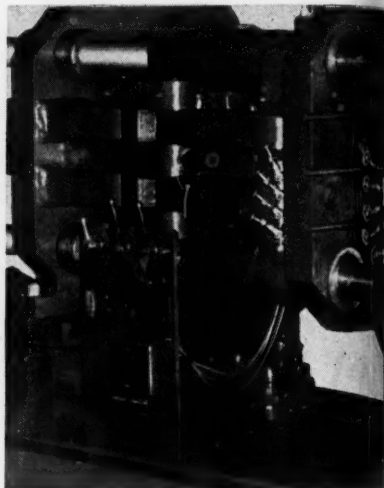


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**WHEELOCK, LOVEJOY & CO., INC.**  
130 SIDNEY ST. • CAMBRIDGE, MASS.  
Cleveland • Chicago • Newark  
Cincinnati • Detroit • Buffalo

the wear and strain of high-speed production schedules. Construction of the extra-heavy die plates is such that all possibility of breakage is claimed to be eliminated. Welding at the juncture of toggle link and die plate is said to further increase strength and durability.

The toggle arrangement, according to the manufacturer, permits the die plates to be moved and locked with a hydraulic pressure of less than 300 lbs. against the actuating mechanism. Con-



**Sectional Enlargement of G & M High-Pressure Hydraulic Die-Casting Machine Showing Extra-Large and Extra-Heavy Die Plates; Large Diameter Tie Bars; Toggle Links Flame-Cut from Solid Steel Blocks, and Welded Junctures of Toggle Links and Die Plates**

struction and design of the toggle mechanism, however, provides a locking pressure of approximately 500,000 lbs. The manufacturer states that the toggle linkage is such that no strain is exerted on the link pins in stopping the forward motion of the movable die plate. Instead, the machines are equipped that the actuating movement of the linkage is stopped when the hydraulic piston which moves the linkage comes in contact with the movable die plate when the die is locked.

Steel hardened bushings are used on all bearing surfaces in the toggle linkage, and the link pins are exceptionally

# **LUFKIN** Chrome Face Steel Tapes For Industrial Plants



## **Easy to Read Markings That Are Durable**

The new Lufkin Chrome Face Steel Tapes, combining the easy-to-read features of jet black markings on satin-chrome background, have durability far exceeding anything yet developed in this kind of tape.

Users find them easy to read even in poor light—and because the tape is metal throughout, it's extra strong, and won't crack, chip or peel. The smooth chrome plated surface won't rust and is easy to clean. Without doubt, these are the most perfect steel tapes ever made.

**BUY THROUGH YOUR DISTRIBUTOR**

**NEW YORK**  
106 Lafayette St.

**THE LUFKIN RULE CO.**  
SAGINAW, MICHIGAN

Canadian Factory  
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large in diameter. Tie bars are also of a large diameter, and the bearing surface for each tie bar totals 230 sq. in. distributed over 22 linear inches. This construction is said to prevent any movement other than the straight forward movement of the die plate, thereby reducing wear and breakage of die aligning pins.

All hydraulic regulating valves are located on the operator's side. All high-pressure hydraulic piping is concealed in the base, and the connections are oxyacetylene welded to prevent possibility of leakage. Motor and pump are mounted on the base, and, in casting zinc, tin, and lead-base alloys, the motor, pump, furnace, and all burner equipment are similarly mounted. The base, which is 48 in. wide x 182 in. long, weighs approximately 4,000 lbs. It is flanged on all sides to prevent water from the die-cooling system from running onto the floor and is reinforced with a 6-in. steel channel and cross members to add maximum rigidity and prevent weaving.

A hydraulic valve arrangement for ejecting and core-pulling is standard equipment on both types of machines.

and the machines are equipped with a Vickers hydraulic two-stage pump and control valves. The machine for zinc, tin, and lead-base alloys is designed in such a manner that the gooseneck or the furnace pot can be replaced without disturbing the hydraulic piping. Weight, crated, 18,000 pounds.

## Cleveland Wall-Type Crane

The illustration shows a wall-type crane recently designed and built by The Cleveland Crane & Engineering Co., Wickliffe, Ohio, for the Norfolk Navy Yard. The crane has a horizontal reach of 30 ft. from center of hook to center of runway rails. Capacity is 5 tons at 20-ft. reach and 3 tons at 30-ft. reach. The total lift is 22 feet.

The crane is of all welded steel construction with roller bearings throughout. Six wheels are provided for the jib travel; two for the vertical loading, two at the base of the crane for the wall compression loading, and two upper wheels for the wall tension loading. The jib travel is powered by two individual duplicate drive units which

**THE VERNON MILL--**  
**Just Turn the Wheel . . .**  
**There's your Spindle Speed!**

*The Right Speed  
 For Every Job*

*Just Turn  
 the Wheel*

*As Easy  
 As That*

**Features:** Fully-enclosed Variable Drive; Choice of two standard speed ranges, either 100-1000 RPM or 150-1500 RPM; New Departure Ball Bearings in counter shaft; Spindle has No. 9 B.&S. taper, mounted in Timken Tapered Roller Bearings; Can be arranged for power feed.

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High Production is based on obtaining maximum machine and tool Performance.

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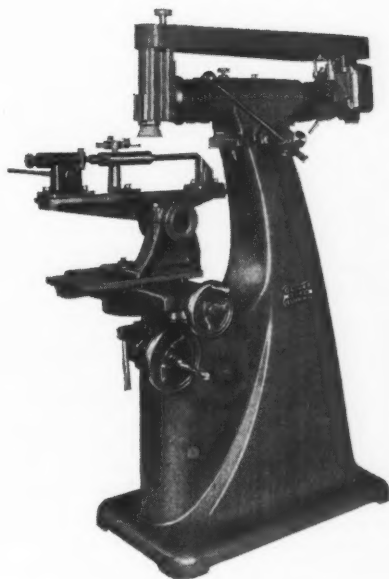
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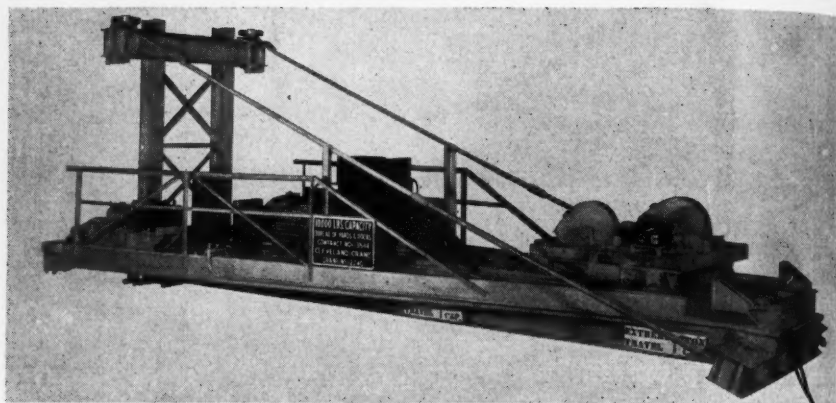
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operate simultaneously. Magnetic control is provided for all motors. The jib travel speed is 200 ft. per minute, trolley speed is 75 ft. per minute, and hoisting speed is 30 ft. per minute. Two motors are used for jib travel and one each for the other motions.

### Federal Improved Model N B-60 Comparator

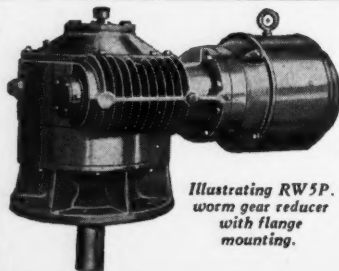
The illustration shows the improved Model N B-60 comparator, together with a special fine adjustment arm or indicator bracket, which has been placed on the market by the Federal Products Corp., Providence, R. I. The principal feature of the improved gage is the base, which has entirely been redesigned to provide for more efficient use.

The base is supported on three feet

instead of four, as was previously the case, to assure positive footing. Holes are provided in the base through which an angle attachment can be fitted to hold cylindrical work or to act as a stop for work placed on the platen. The supporting column is more heavily constructed, and the regular supporting bracket now holds the indicator by the back instead of by the stem, thereby eliminating any possibility of the stem binding the rack spindle.

An AN-4 attachment such as shown in the illustration can be furnished with the Model N B-60 comparator at an additional charge. This attachment takes the place of the regular supporting bracket and provides a fine setting for the indicator by means of a thumb-screw located in front of the post. The attachment permits adjustment of ten to twenty thousandths of an inch.

The Federal Improved Model N B-60



Illustrating RW5P.  
worm gear reducer  
with flange  
mounting.

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| Size  | Length Overall<br>Inches | Length of Flute<br>Inches | Our Net<br>Price Each |
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| 3/16  | 12                       | 9                         | \$1.50                |
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Put these husky Bristo Socket Screws through their paces, — on your machines or in your products. Note their ease of handling, holding power, ability to withstand the assaults of the wrench where operations demand repeated removal and resetting. You will soon realize why so many manufacturers agree that a Bristo's easier, faster, tighter set-up saves assembly time, abolishes waste motion, helps lower production costs, — benefits you want to enjoy.

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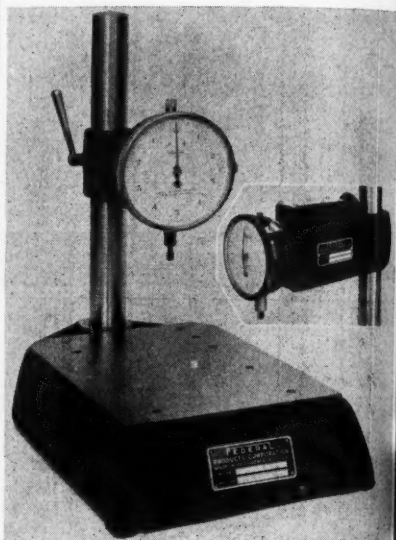
Learn what these superior screws can do for you. The Bristol Company, Mill Supply Division, Waterbury, Conn.



**BRISTO**  
SOCKET SCREWS



Comparator is regularly furnished with an "E" size or 3/8-in. diameter indicator graduated in 0.0001 in. When the AN-4 attachment is used, a "D" size or 2 1/4-in. diameter indicator is furnished graduated in 0.0001 in. Other indicators, however, can be substituted if desired. The Model N B-60 comparator is particularly adaptable for setting and



Federal Improved Model N B-60 Comparator

checking other gages to be used in production inspection and can be used directly in production inspection.

### Kent Duplex Horizontal Drilling Machine

Designed primarily for drilling cotton pin holes in screws, bolts, and so on either through the head or the shank the duplex horizontal drilling machine shown herewith, product of The Kent Machine Co., Cuyahoga Falls, Ohio, can also be applied to a variety of drilling problems of similar nature. The action of the drill spindles is such that the drills enter the opposite sides of the work simultaneously and proceed to a point near the center of the piece where one of the drills is withdrawn

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Available With Motor In Base, Counter-  
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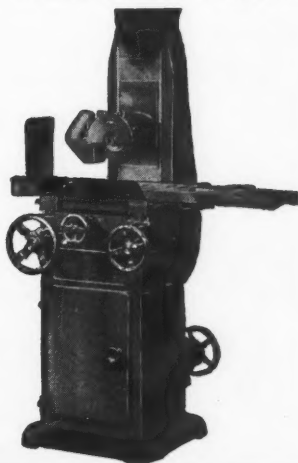
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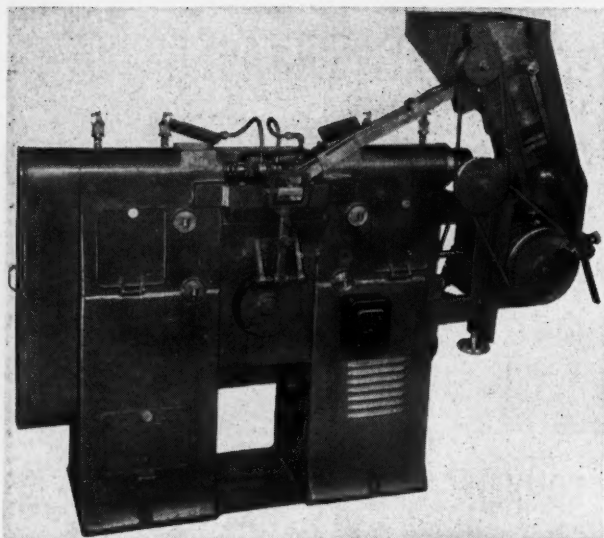
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(as illustrated)

**\$215**

F.O.B.  
Factory

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Kent Duplex Horizontal Drilling Machine

base of the machine with independent drives to each drill spindle in addition to a worm drive to control the drill feed and operate the grip jaws. The main drive shaft within the base of the machine carries a sprocket for driving the cutting lubricant pump which is located over a sump in the base of the machine. The coolant is piped to the drill bushing holders, thereby assuring a continuous forced stream of oil on the drill at all times.

and other follows through, completing the hole. The work to be drilled is rigidly held between two grip jaws carrying drill bushings which centralize the work. These grip jaws are provided with drill bushings for guiding the drills.

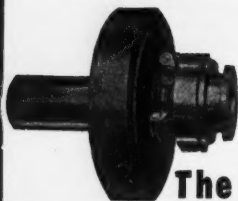
The drilling speed of the spindle, the feed of the drill, and the depth of cut can be varied independently; the former by four-step cone pulleys for single V-belt drive, and the latter by change gears and adjustable link mechanism from cams to the reciprocating control of the drill spindle sleeves. Access to this linkage adjustment is through two doors at the front of the machine.

A single motor is located within the

The Kent Duplex Horizontal Drilling Machine can be furnished either with a semi-automatic or fully automatic work feeder. The machine shown in the illustration is fully automatic including a hopper, galley from hopper to the transfer mechanism, and the transfer mechanism which carries the work from the galley to the grip jaws. The hopper can be eliminated and the work fed into a short galley from where it is taken to the grip jaws by the transfer mechanism. Or, all of the automatic feed attachments can be eliminated, in which case the operator feeds the work by hand to the grip jaws.

The machine has a capacity for drilling screws up to  $\frac{1}{8}$  in. either in diame-

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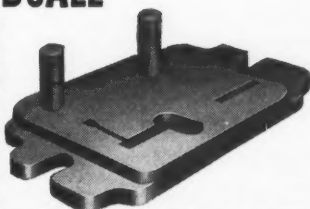
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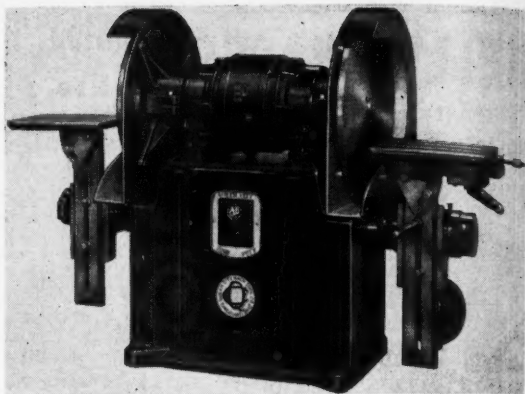
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ter of shank or across flats of head. Drill capacity is  $\frac{1}{4}$ -in. diameter. The combination of speed and feed controls obtainable is said to make the machine adaptable for drilling any type of steel.

## Queen City 7½ and 10 H.P. Heavy Duty Disc Grinding Machines

Presented herewith is a heavy duty disc grinding machine, available in two sizes, which has been placed on the market by the Queen City Machine Tool Company, 218 E. 2nd St., Cincinnati, Ohio. The No. 75 machine is 7½ h.p. and the No. 100 machine is 10 h.p. Either machine can be furnished with 24, 26, 28, or 30-in. discs, to operate at 900 or 1,200 r.p.m. respectively.

The spindle diameter is 2¾ in. and



Queen City Heavy Duty Disc Grinding Machine

the wheel flanges are 8-in. diameter by 2¾ in. thick. The plain table top is 12 x 17 in., and universal lever feed table with micrometer feed is the same size. The rocker shaft is 3½-in. diameter by 7 in. long and the distance from center of spindle to center of rocker

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Sellers 1G Drill Grinder Grinds drills from No. 70 (.028") to ½" and produces accurate drill points of 160 to 65 degrees included angle.

Recommended by leading drill manufacturers.

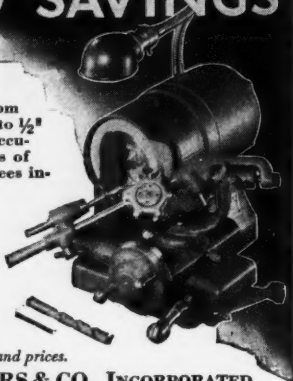
Speeds production. Saves money.

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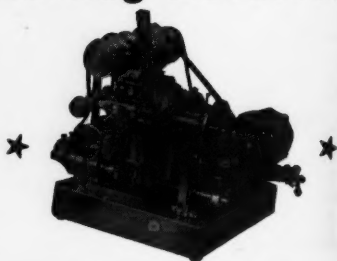
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## "Waltham" Pinion Cutting Machines

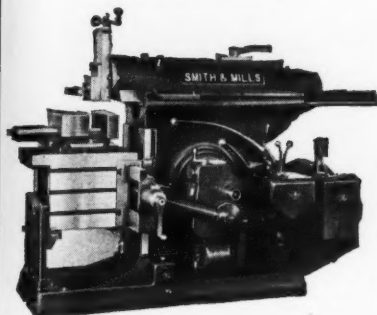


Are made with a variety of equipments. They will make the two or three successive cuts needed for watch pinions or may be used for fine pitch gears up to 1½" diameter. There is also a 4" size. If you will describe your work we will send details.

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Automatic lubrication—forced feed. Multiple disc clutch and brake. Quick feed changes. Direct reading feed and stroke dials. Power rapid traverse to cross feeds.

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Motor  
Driven  
Milling  
Machine

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Burke motor driven milling machines, Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

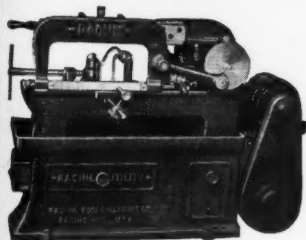
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shaft is 17½ in. Height of spindle from floor, 38¾ in. Operating floor space required, 7½ x 3 ft. Weight, net, No. 75 machine, 3,350 lbs.; No. 100 machine, 3,700 pounds.

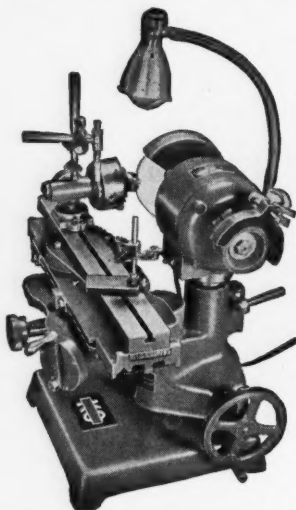
## Farrel-Birmingham Hydraulic Press of Streamlined Design

The 20 x 20-in. hydraulic press here illustrated is one of twelve recently built by Farrel-Birmingham Company,

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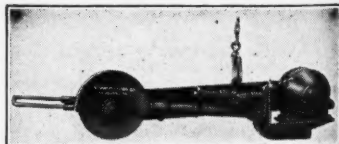


**Farrel-Birmingham Hydraulic Press of Streamlined Design**

only provides improved appearance, but facilitates keeping the press clean and the floor area orderly.

The housing, which includes the top,

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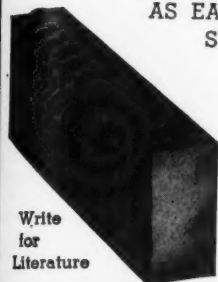
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| 20 in. | 20 in.                                       | 1,000               |
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Four-Chilled  
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### MODEL 25 HI-DUTY MARKING MACHINE

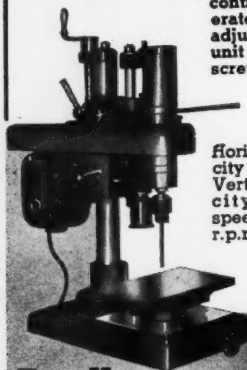
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For small holes .004" to .250" diameter. Self-contained drilling unit swings radially on column and locks to any position. All controls manually operated. 8" vertical adjustment of drilling unit with elevating screw.



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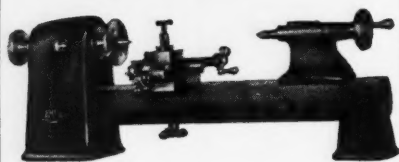
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Precision lathes for doing most accurate turning, drilling, milling, threading, filing, polishing, in the tool room or in production.

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bottom and sides, is a single casting. Set in the base of the housing is a cylinder made of Meehanite. The cylinder and gland are lined with bronze and the gland studs and nuts are stainless steel. These features prevent corrosion and add to the ease and economy of maintenance and increase the life of the press.

The press is designed to operate at an initial water pressure of 2,000 lbs. per square inch, giving a total pressure of 113 tons or 563 lbs. per square inch on the platens. Design and materials provide the strength required for minimum deflection.

The press is equipped with three 20-in. square plates of rolled steel, machined to provide a smooth finish and drilled to permit maximum steam circulation and uniform heating. Steam connections for the platens are flexible metallic tubing and are fully enclosed in the housing and covered by the sheet metal guards. The latter can be quickly removed to give access to the platens and piping. The temperature of the platens is automatically controlled by an air-operated diaphragm valve, which is located in an opening in the top of the press. The temperature of the platens, steam, air and water pressure are all indicated by gages mounted in a panel on the front of the press, so that they are readily visible to the operator.

### Comet Portable "Heavy Duty" Arc Welder

To meet the demand for a portable heavy duty arc welder economical to operate and of low initial cost, the Comet Products Co., Chappaqua, N. Y., has developed the engine-driven arc welder illustrated herewith. Outstanding features of this unit include self-excitation, self-stabilization, and simple control.

The welder, according to the manufacturer, can be used for mass production welding on a 24-hour basis over a long period of years. The heavy duty construction of the unit is said to allow for the use of relatively large size electrodes at high average amperes without danger of burning out, thus permitting faster sustained welding at lowest cost. The welder's simple control of both current and voltage, it is claimed, enables the operator to select quickly the best possible combi-

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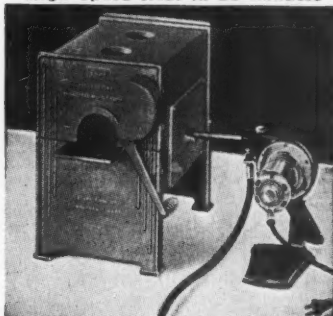
Combination Demagnetizer and Electric Etching Pencil. Marks symbols in hardest steel. Demagnetizes instantly. One of our models popular in tool rooms for 15 years.

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DEPT. MS TOLEDO, OHIO

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Powerful torch used separately as a very handy portable flame, \$30. High Speed Muffle Furnace, no scaling or decarburization, reaches high speed heat in 20 minutes at 70 per hour; quickly saves its cost. Muffle 7"x3 1/2"x2 1/4", \$40. Also a larger furnace with built-in torch, muffle 7"x4 1/2"x3 1/4".

**STARK TOOL CO.**

Originators of the American Bench Lathes  
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Three  
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**FLEXIBLE SHAFTS up to 10 H.P.  
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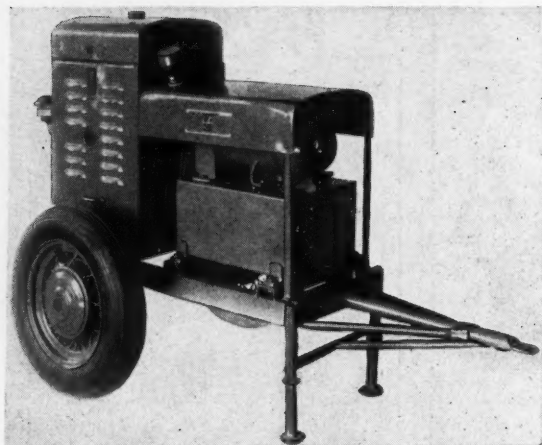
**N. A. STRAND CO.**  
5001 N. Wolcott Ave. Chicago

## SERVICE

High Speed  
Steel  
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Rotary Cutters



MODERN MACHINE SHOP 199



Comet Portable "Heavy Duty" Arc Welder

nation to meet the many varying conditions found in modern welding practice. Every combination of voltage and current values is different; there are no duplicate settings, and adequate mark-

the trade name of "Modern," is announced by the Quality Hardware Machine Co., 5861 N. Ravenswood Ave. Chicago, Ill., for use on lathes, shapers, milling machines, and turret lathes.

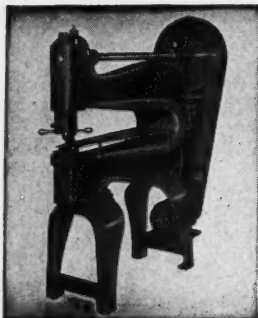
ing of the controls enables the operator to obtain instantly the heat he desires.

The Comet Portable "Heavy Duty" Arc Welder is offered in 150 and 200 amperes powered by a Waukesha four-cylinder air-cooled engine and in 300 amperes powered by a water-cooled six-cylinder Continental engine. The welder is also available equipped with a Waukesha "Hesselman" Diesel at an additional cost.

### Quality "Modern" Ball Bearing Motor Drive

A complete line of individual ball bearing motor drives, to be known under the trade name of "Modern," is announced by the Quality Hardware Machine Co., 5861 N. Ravenswood Ave. Chicago, Ill., for use on lathes, shapers, milling machines, and turret lathes.

### SAVAGE NIBBLING MACHINES Powerful Direct-Over-Center Drive Totally Enclosed Revolving Head

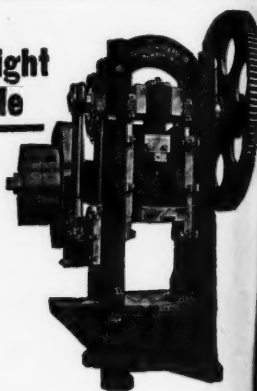


A Modern Sheet Metal Cutter for Modern Sheet Metal Shops.  
Capacities to  $\frac{3}{4}$ ". Throat depth to 36".

ASK FOR BULLETIN "E" 1940.

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KNOXVILLE Since 1885 TENNESSEE  
Pioneer Manufacturers of Nibbling Machines

### Straight Side



Outstanding in every detail for heavy blanking and forming work. All stresses are taken centrally.

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184 Vanderpool St. Newark, N. J.

GUARANTY  
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YEARS

When you purchase a STEEGE Drive for your lathe, shaper, mill, etc., you are protected by our broad 5-yr. guarantee.

STEEGE Drives are factory installed — prices \$85.00 and up. Approval. Lot 1

W. L. STEEGE  
1850 W. MO



## U. S. HEADS

STANDARD SINCE 1915



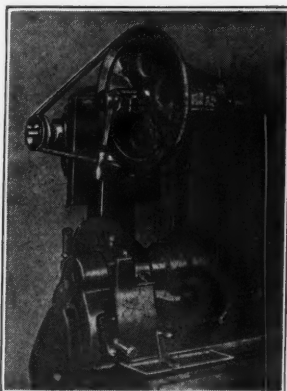
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Both Spindles  
Adjustable

The United States Drill Head Co.

1954 Riverside Drive  
CINCINNATI, OHIO

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5  
YEARS



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STEEGE Drives are easily installed —

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W. L. STEEGE MACHINERY CO.

(Our 23rd Year)

30 W. MONROE ST., CHICAGO, ILL.

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GRIT AND ABRASIVES  
CAN'T HURT THEM!



### TANK UNITS

Available now in  
three standard  
tank sizes: 4, 11,  
and 32 gallons.

Model UL with 1/4 H.P.  
Motor and No. 1 Tank

Ruthman Gusher Coolant Pumps are designed to permit grit and abrasives to pass through them with *no harmful* effects. With split-second control, twin-suction balanced intakes, and many other patented features, Ruthman Gushers will solve your coolant problems.

All Gusher models are precision-built, ball-bearing, quiet, and self-cleaning. There's a Gusher model to fit your needs. Write for engineering data and specifications.

## THE RUTHMAN MACHINERY CO.

538 E. FRONT ST., CINCINNATI, OHIO

LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS

The line consists of 15 models.

The Modern Motor Drive is designed primarily for converting line shaft drives on cone pulley machines to individual motor drives. The drive is a complete, self-contained unit which includes a motor mounting that can be easily attached by means of four bolts. V-belts are used for the motor drive to the countershaft which runs in two ball bearings, the final drive being made by standard flat belt.

In addition to the advantage of eliminating line shafts, the Modern Ball Bearing Motor Drive is said to provide

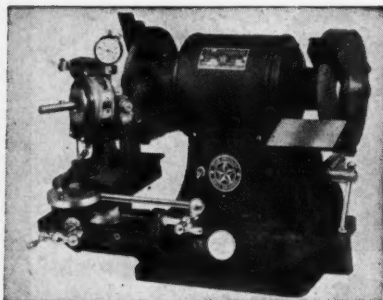
accurate alignment of drive and drive pulleys. Adjustment is provided to maintain all shafts and pulleys in correct driving alignment. A crank and



Quality "Modern" Ball Bearing Motor Drive

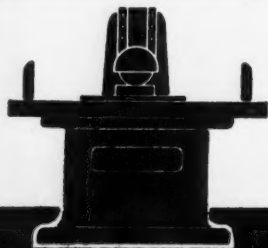
screw control, which actuates a cam operating directly against the base of the motor and drive shaft mounting, enables a wide range of adjustment to be obtained. The fast and positive action of the adjustment is said to enable belts to be kept constantly at proper tension or to be loosened as needed for shifting of cone pulley drives. The drive is controlled by hand but can be equipped with electrical control if desired.

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Produces perfect points on drills No. 41 to  $\frac{1}{4}$ "  
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Division Star Electric Motor Co., Bloomfield, N. J.



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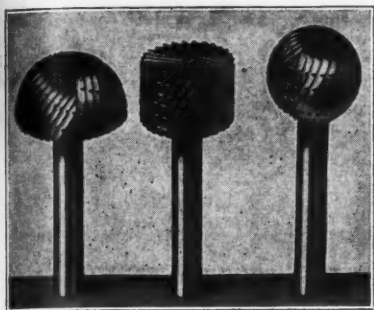
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## FORD GROUND CUTTERS



Just a few of the many standard shapes which are carried in stock.

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(Patented)

First tool of its class with built-in motor and speed-changing mechanism, entirely eliminating mill-wrighting. Nothing under bench — Nothing overhead. Drive integral with the lathe itself. Marvelous compactness. Any powerful vibrationless speed at a turn of the hand wheel in front. Belted and wired, ready to run. Priced at only slightly more than other precision lathes with separate, complicated drives. Two splendid sizes. (Colored Bulletin J).

Also Stark Standard Precision Lathes, 6 sizes,  $\frac{1}{4}$ " to  $1\frac{1}{4}$ " capacity and up to 12" swing; with complete equipment. Stark Spiral Bench Millers, the most accurate of their type.

Stark Tool Co. Est. 1862 Waltham, Mass.

Originators of the American Bench Lathe

## YOURS FOR THE ASKING—THIS NEW CERROMATRIX MANUAL

This 36 page booklet describes—with plenty of photographs and drawings—how substantial savings are being made in many precision metal-working operations. The manual gives details regarding practices in use in tool and production departments of many leading concerns—released with their permission.

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**ALSO FOR  
SAWING  
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ILLINOIS stands up longer... yet continues to produce highly accurate filing, sawing and stoning work. Write for descriptive literature today.

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Designed for handling office and supply room materials and a wide variety of lightweight items in industrial plants and warehouses requiring lift truck equipment lighter than that available heretofore, the Barrett-Cravens Co., 3250 W. 30th St., Chicago, Ill., has brought out the "Half Ton" lift truck shown

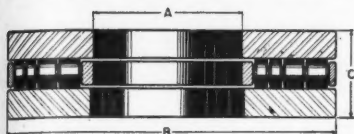


Barrett-Cravens "Half Ton" Lift Truck

herewith. This unit can be used as a combination lift truck with a full 2-in. lift for large loads handled on skids and as a floor truck for bulky, single objects such as barrels, cases, bales, tote boxes, small bins, and so on.

The Barrett-Cravens Half Ton Lift Truck is equipped with four ball bearing wheels, the front wheels being of the swivel type. The U-shaped tubular steel handle when pulled down to an angle of slightly more than 45 deg. lifts a loaded skid. The truck platform is lowered by means of a slight finger pull on the trigger chain. The truck is of rugged all-welded steel construction with ample structural reinforcement of the handle, chassis, and platform to eliminate distortion or sagging. Light in weight, the truck can be readily moved about even under capacity load and occupies a minimum of floor space when not in use.

# -GWILLIAM-



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## ROLLER THRUST BEARINGS

Made with flat seats and in a variety of self-aligning types.

These bearings are especially adapted for heavy loads at slow or moderate speeds.

Standard sizes are shown in our general catalog, sent upon request.

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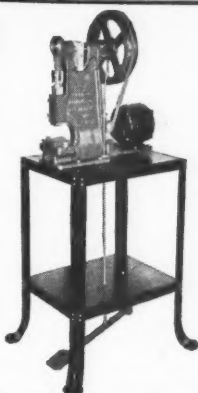
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No. 1

## HIGH SPEED PRESS

Why use a large expensive Press for your small metal stampings when this strong, well made, Safety Clutch Press will provide more? Save money on die construction.



## DIE BOLSTER WITH PRESS

Weight 155 lbs.

Flywheel 23 lbs.

Ram Stroke  $7\frac{1}{8}$ "

Punch Hole  $5\frac{1}{8}$ "

Height of Press 22"

Diameter 11"

Ram to Bed  $2\frac{1}{4}$ "

Depth of Throat  $2\frac{3}{4}$ "

Speed 250 R. P. M.

Price \$100.00 F. O. B.

**MILLIKEN MACHINE CO.**

WEST NEWTON

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## 3 Reasons You Can Depend On Mac-its To Cut Costs

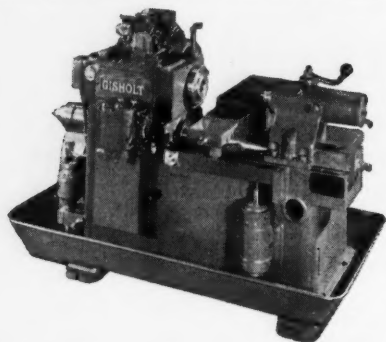
1. All standard diameters of socket screws are milled from electric furnace steel held to 5-point carbon range.
2. Each Mac-it is heat-treated especially for the particular kind of service it will encounter.
3. Perpetual process testing at the machines, plus modern, laboratory testing insure uniformity, durability, and fit.

Write for catalog and prices

**THE STRONG, CARLISLE & HAMMOND COMPANY**  
1392 West Third St., Cleveland - Ohio

## Gisholt No. 12 Hydraulic Automatic Lathe

A hydraulic automatic lathe for between-centers and chucking work has been announced by the Gisholt Machine



Gisholt No. 12 Hydraulic Automatic Lathe

Co., 1219 E. Washington Ave., Madison, Wis. The machine, designated as the No. 12, is said to find wide application on production turning jobs such as gear

blanks, cylinder - liners and pistons, small impellers and flywheels, and so on.

The No. 12 machine is equipped with a hydraulically - operated main clutch and an automatic spindle brake. It has a swing of 16 $\frac{1}{2}$  in. over the bed or 12 in. over the front carriage, with a length between centers of 22 in. The outstanding feature of the machine is a simplified hydraulic control system which permits the handling of all functions of the machine by means of a single lever. The front carriage as well as the rear slide has independent hydraulic feed.

## Russell Ball Bearing and Self-Aligning Sleeve Bearing A.C. Motor

The Russell Electric Co., 352 W. Huron St., Chicago, Ill., is now offering a line of ball bearing and self-aligning sleeve bearing, shaded-pole, a.c. motors which are said to have high locked rotor and accelerating torque in combination with high electrical efficiency and large output per unit weight.

Alignment of the mechanical system

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SAVES AN AVERAGE OF \$4.80  
EACH HOUR IT'S USED



Inside and outside cuts on dies, shoes, templates and endless other jobs can be done in a small fraction of the time required by former methods. Saws, files and polishes. A highly developed, large capacity machine.

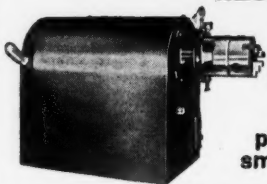
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THE TANNEWITZ WORKS

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PRODUCTION  
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for speedler grinding, lapping, filing, polishing small parts

## VARIABLE SPEED LATHE

Any desired spindle speed at will—from a low of 65 r.p.m. to a maximum of 6300 r.p.m. (at a ratio of 13 to 1)—simply by moving a hand lever! Does the job quicker, better, cheaper!

Equipped with Standard NEMA frame motor, completely enclosed; automatic braking system; 3-jaw universal chuck. All parts quickly, easily accessible. Rugged. Occupies 12"x18" bench space. Write for Cir. 400. We design lathes to meet your individual production requirements. Write!

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**Free Cutting!  
Non-Glazing!  
Abuse Proof!**

## New WTTCo Diamond Impregnated WHEEL DRESSER

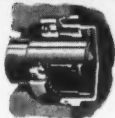
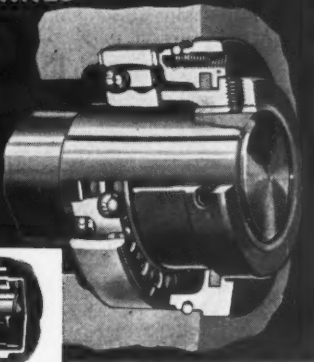
Whole, natural diamonds of high quality and  
extreme toughness are spaced regularly through-  
out the matrix to give great accuracy, uni-  
form dressings and to hold wheel to size.  
These stones are anchored permanently in their  
matrix by strong chemical bonds that will not  
break under heat, pressure or rough abuse. No  
remounting! Lowered costs! After tool is put  
in machine it will give best results if left in  
original position. It is not necessary to turn or alter  
the area in contact with the grinding wheel.

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**WHEEL TRUEING TOOL CO., INC.**  
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In Canada: 575 Langlois, Windsor, Ont.

# NEW SIMPLE METHOD FOR FITTING BALL BEARING UNITS INTO MACHINES



Closed type  
optional

**by Ahlberg**

MANUFACTURERS CAN NOW quickly  
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housing is an integral part of the machine.

## **CJB** SIMPLEX MACHINE UNITS

- Available in 3 capacities for  
light, medium and heavy loads  
with either single row, double row  
or self-aligning ball bearings.
- Shaft mounting is either direct  
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other harmful elements.

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that com-  
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trates and  
describes  
the applica-  
tion of these  
units.

## **AHLBERG BEARING COMPANY**

Manufacturers of **CJB** Master Ball Bearings  
3029 West 47th Street Chicago, Ill.



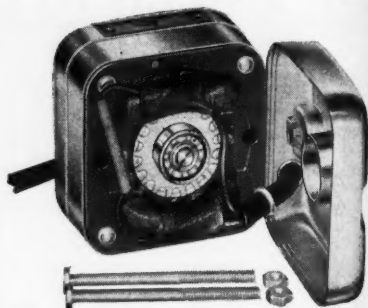
*Simplex*

# MACHINE UNITS

of each motor is accomplished by the use of a die cast end frame with a spacer held in compression by means of through bolts. A recess is provided in the end frame for the spacer shell, and a second recess positions and locates the stator. According to the manufacturer, bearing alignment is maintained even though the motor is subjected to rough treatment. The bearing housing instead of projecting externally is nested between the stator coils, thus making the motor extremely compact in design. The design also includes a flat external

end frame surface which enables the motor to be easily mounted on gear boxes and other flat surfaces.

According to the manufacturer, the Russell Ball Bearing and Self-Aligning Sleeve Bearing A.C. Motor will operate



Russell Ball Bearing and Self-Aligning Sleeve Bearing A.C. Motor

in any position and will withstand substantial end thrust. Self-aligning, semi-oilless sleeve bearings are also available with the motor. Power output ranges from 3 to 15 watts. The motor is of four-pole design and has a maximum speed of 1,600 r.p.m. The unusual design and mechanical features of the motor are said to make it suitable for a wide variety of motive-power applications.

### Fray No. 7 "All Angle" Milling Machine

Speed, accuracy, versatility, and rigidity are among the outstanding features claimed for the Fray No. 7 "All Angle" Milling Machine shown herewith, product of the Fray Machine Tool Co.,

## KAR DUO MAGNETIC CHUCK

TO HOLD AND DEMAGNETIZE  
WORK ON ONE UNIT WITHOUT  
A SEPARATE DEMAGNETIZER



GUARANTEED TO GIVE EFFICIENT  
AND SATISFACTORY SERVICE

MANUFACTURED BY THE MAKERS OF  
KAR TIME-SAVING ACCESSORIES

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THE KAR ENGINEERING CO., INC.  
200 Hudson Street New York City

## CRAFTS Tungsten Carbide GAGES



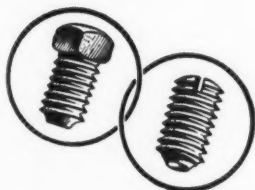
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Headless to 1/2-13—  
Square Heads to  
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Our table, "Number of Linear Feet  
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44 Farnsworth St., Boston, Mass.

For 60 Years Mfgs. of Quality Screws

## EVEREDE TWO-STEP BAR



The *ONLY* Boring  
Bar with the eco-  
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Designed to use a larger diameter bar  
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This gives you rigidity, higher boring  
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SEND FOR DESCRIPTIVE FOLDER.  
Representatives in all principal cities.

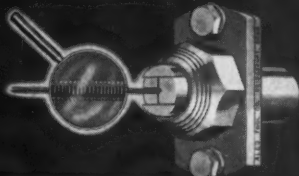
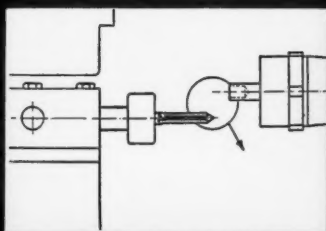
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WILLIS STUTSON

180 N. Wacker Drive

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*Accurate alignment reduces tap breakage  
— especially in small  
hole tapping*



Most broken taps are caused by imperfect alignment, as shown in exaggerated diagram. Even slight wear of the spindle causes many broken taps. Equip your screw machines with ALCO Tools and you'll overcome this difficulty. The exclusive floating feature makes absolute concentricity easily attainable. Adjustment is simple yet positive, on old or new machines. They cure your bushing headaches, too, for no bushings are required with ALCO Tools. Write today for full particulars.

ALCO TOOL COMPANY, 835 Housatonic Ave.,  
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**ALCO TOOLS**

EFFICIENT

MODERN MACHINE SHOP

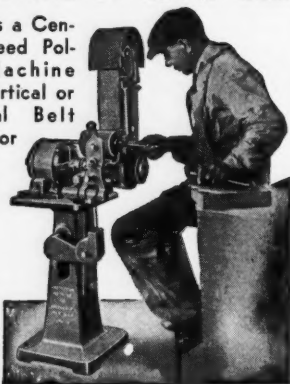
209

## **PRODUCTION POLISHER & SURFACER TYPE "S"**

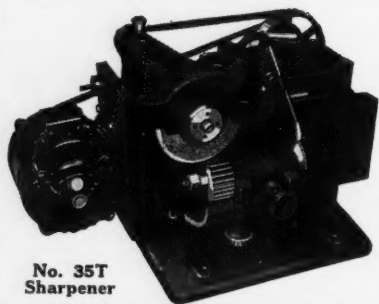
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**Saves Labor**



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GREENFIELD, MASS.  
POLISHING MACHINES, SENSITIVE DRILLS



**No. 35T  
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Up to 5½" diameter and up to 1¾" thickness. 100 SAWS of 26 GAUGE CAN BE SHARPENED AT ONE TIME.

The saws are automatically indexed and sharpened within a variation of plus or minus .001 of exact diameter of entire lot.

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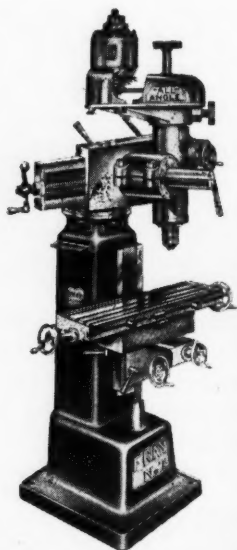
**THE WARDWELL MFG. CO.**

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Cleveland, O.

W. Windsor Rd., Glendale, Cal. The machine castings are made of Meehanite G. C. and the feed nuts of Ampco metal. All feed screws are calibrated in 0.001 inch.

The No. 7 machine has a longitudinal



**Fray No. 7 "All Angle" Milling Machine**

travel of 15 in. and a cross travel 8 in. The overarm travel above the turret is 12 in.; the longitudinal travel with the turret set over is 26 in. Height to the center of the overarm is 54 in. and the maximum distance from spindle to the column is 18 in. Table size, 7½ x 26 in. Floor space required 25 x 30 in. Weight of machine mill attachment, 1,475 pounds.

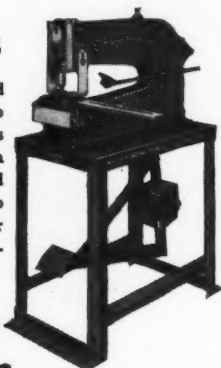
## **Janette Type RW5P Speed Reducer**

The illustration shows the Type RW speed reducer which has been introduced by the Janette Mfg. Co., 556 W. Monroe St., Chicago, Ill. This reducer is a combination of worm planetary gearing. According to manufacturer, high efficiencies and usually quiet operation are obtained.

## WHITNEY-JENSEN TOOLS

### No. 58 FOOT PRESS

For speed and accuracy, use the No. 58 Foot Press equipped with a special punch and die. Will help you solve your production problems.



Write today!



No. 5 Jr. PUNCH.  
Capacity  $\frac{1}{4}$  in. hole  
in 16 ga.

**Whitney Metal Tool Co.**

110 FORBES ST.

ROCKFORD, ILL.

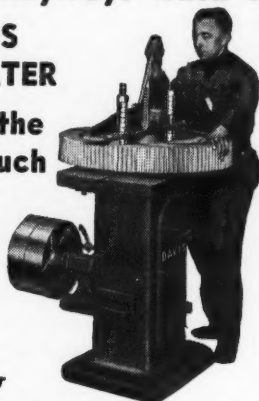
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Will do the  
job so much

faster  
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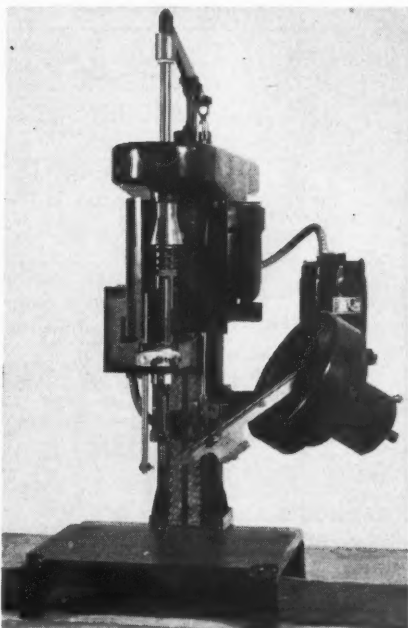
**DAVIS KEYSEATER CO.**  
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## Announcing . . . New Model "A"

### MAGAZINE FEED POWER SCREWDRIVER

The Machine you have been waiting  
for. Drives No. 2 to No. 6 Screws.

A STURDY—EFFICIENT—PRACTICALLY  
DESIGNED MACHINE.



Eliminates the troublesome handling of  
small screws.

Screws always in sight of operator.

Sensitive, easily adjusted spindle clutch  
to meet all requirements of screw tension.

Table designed for conveniently oper-  
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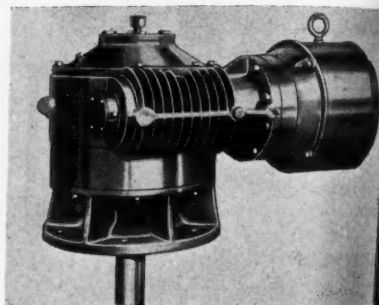
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PRODUCTION ESTIMATES.

**DETROIT POWER SCREWDRIVER CO.**  
5375 Rohns Avenue Detroit, Michigan

using worm gearing for the first reduction and planetary gearing for the second reduction.

In the first reduction, a hardened alloy steel worm is used with a cast iron bronze gear, the teeth of which are cut to closely conform with the worm. This construction is said to result in added strength, less heating, and longer life for the gears. The bronze gear is keyed to the hub of a steel pinion which is in mesh with the three steel planet gears of the second reduction. These planet gears turn on hardened steel studs located 120 deg. apart on a heavy, steel

disc which is forged integral with a rugged countershaft. The steel disc is driven by the rolling action of the planet gears between the steel pinion and a large internal gear, cut directly into the inner surface of the heavy



Janette Type RW5P Speed Reducer

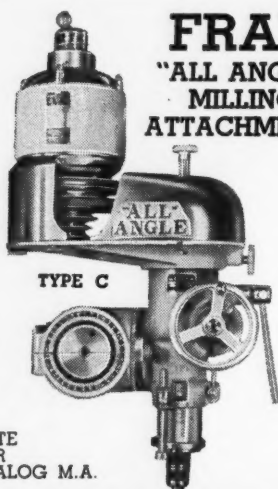
nickel, cast iron housing of the second reduction.

The Janette Type RW5P Speed Reducer can be supplied for either flange or foot mounting. The unit is available in four models; namely, the RW3P, RW4P, and RW5P. These reducers are exactly alike except in size and are supplied with motors ranging from 1/6 to 10 h.p. The countershaft speeds range from 5.9 to 52 revolutions per minute.

## U. S. Large Size Explosion Proof Motors

U. S. Explosion Proof Motors, product of U. S. Electrical Motors, Inc., E. Slauson St., Los Angeles, Cal.

## FRAY "ALL ANGLE" MILLING ATTACHMENTS

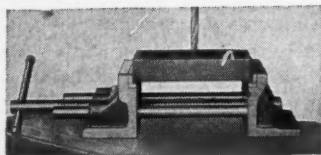


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**FRAY MACHINE TOOL CO.**  
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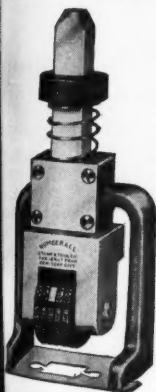
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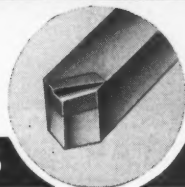


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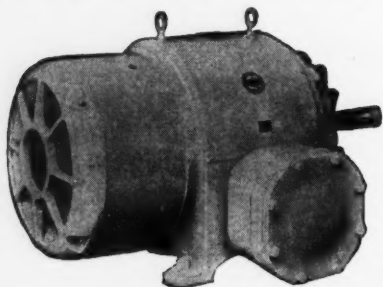
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Underwriters, the ratings have been increased from 25 to 75 h.p. while in Class II Group G, the ratings have been increased from 7½ to 75 horsepower.

The U. S. Large Size Explosion Proof Motor is of shell-type frame construction and has a specially designed fan which is said to operate quietly even at

high speeds. Wiring is made convenient by means of the large terminal box. The fan-end inner-end bell and the outer fan cover bracket are held in place by a simplified-type combination screw. This construction eliminates one set of holding screws and is said to provide rigid mounting for the fan cover and bracket as well as to facilitate the assembly or disassembly of the motor.

## J-B-T Model 70-PO Potentiometer-Pyrometer

A fundamentally new type of portable potentiometer-pyrometer for measurement of temperatures by thermocouples is announced by J-B-T Instruments Inc., 441 Chapel St., New Haven, Conn. The instrument, Model 70-PO, has important applications in industrial, laboratory, electrical, and moving vehicle temperature reading. It is also designed for testing permanently installed temperature measuring and controlling equipment and requires less balancing and less effort to operate than any previous J-B-T potentiometers.

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in room temperature. The instrument can be used under ambient temperature conditions of minus 40 (—40) deg. plus 120 deg. F. (8) The 6¼-in. temperature scale may range from minus 50 (—50) deg. to plus 50 deg. F. up to 0-3000 deg. F. Each scale is drawn to customer's requirements. Knife-edge pointer with mirror scale to avoid parallax is optional; double-scale instrument also is available. (9) The instrument is independent of thermocouple resistance (within large limits), permitting small thermocouples to be used

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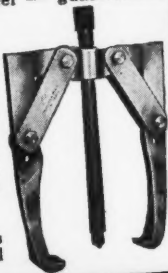
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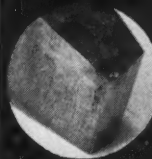


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where other temperature sensitive elements would be too slow, too large, or too fragile. Installation is convenient; thermocouples can be readily replaced. (10) The greatest advantage is less balancing. With scales of 0-400 deg. and higher, once balanced and adjusted, the Model 70-PO is said to require no further balancing operation but is thereafter read as a deflection instrument. On scale below 0-400 deg. F. only one balancing operation is needed for each temperature reading.

The Model 70-PO case is mahogany with lustrous natural finish,  $6\frac{1}{2}$  x  $7\frac{1}{2}$

x  $4\frac{1}{8}$  in., has leather carrying handle cover fitted with slip hinges. Panel is engraved bakelite. Aluminum case for flush switchboard mounting can be supplied on special order. Available thermocouples, leads, and fixtures include all standard materials and various styles for a wide range of everyday uses in industrial plants, utilities, laboratories, aircraft, and automotive test.

## Gripomatic Puller

Of interest to mill and factory maintenance men are the new sizes of OTG Gripomatic Pullers recently made available by Owatonna Tool Company, 350

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Frictionless  
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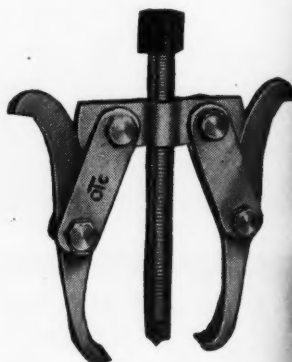
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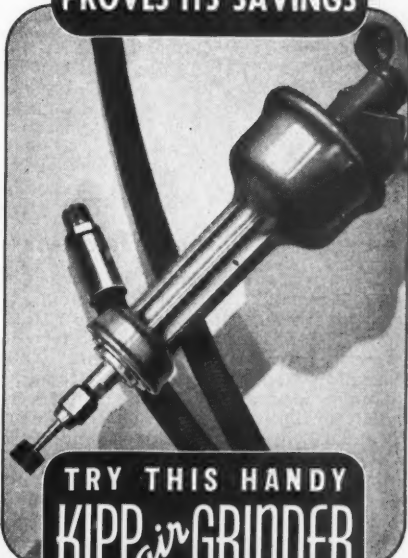
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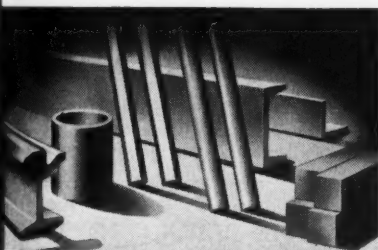
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## Gregory "Softip" Hammers

Gregory Tool & Manufacturing Co., 4300 Tireman Ave., Detroit, Mich., is now marketing a line of "Softip" Hammers designed especially for use in tool-rooms, inspection, experimental, and assembly departments. The Model A hammer is designed to be held in the hand for light tapping, and the Models B and BL are of the conventional hammer design, for use where harder pounding is necessary. Model A has a knurled grip. Models B and BL are made

from aluminum and are perfectly balanced with the "Palm Form" wood handle. Shanks are threaded and cemented into the handles and hexagonal



"Softip" Hammers

set screws are used to tighten and draw the tips to the faces of the hammers.

On the Models B and BL, plastic tips are used instead of the usual rawhide or one copper and one plastic tip can be supplied. Both types can be supplied with tips from  $\frac{3}{4}$  to  $1\frac{1}{2}$ -in. diameter. Copper tips on the Model A weigh from 12 to 48 oz. and on the Model B from 10 to 40 oz. Plastic tips on the Model BL weigh  $3\frac{1}{2}$  to 18 ounces.

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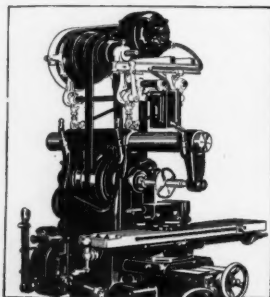
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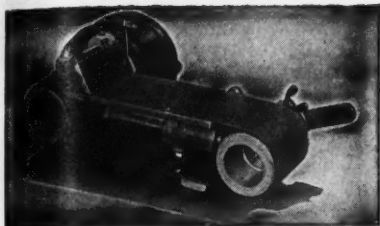


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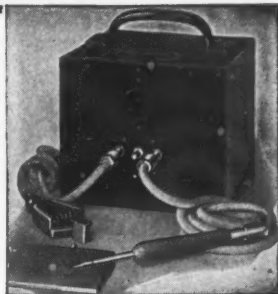
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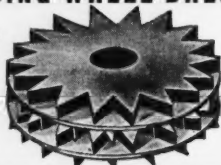
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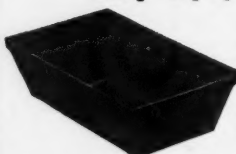


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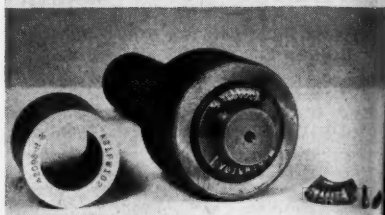
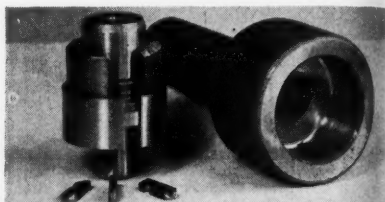
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"New Method" Annular Marker

(3) a snap ring in a groove machine in the shaft for locating the type during assembly by means of grooves cut in the type, (4) an outer spring-steel split sleeve which holds the type in place and (5) the type holder body. The shaft shank of the inner assembly is ground with an angular flat to provide for positive locking.

To change type, a set-stud is unscrewed, thereby permitting the inner assembly to be removed from the type holder body. The split sleeve is spread and slipped downward, thus allowing the type to be easily removed and different characters inserted. After inserting type on the snap ring, the sleeve is slipped back up and the entire assembly is reinserted in the type holder and the single set-stud is tightened. The central shaft extends beyond the holder to act as a locating pin in marking annular parts.

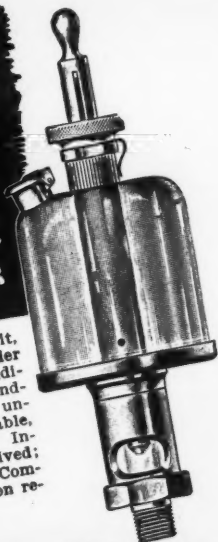
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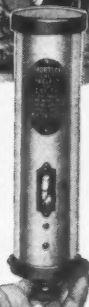
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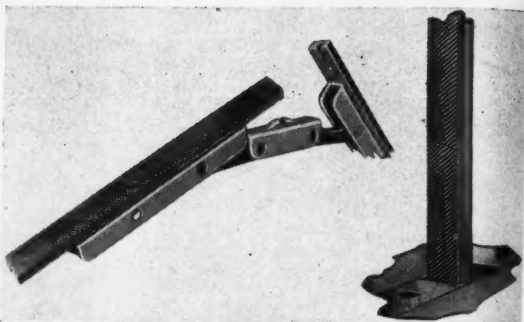
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Shipped Prepaid



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Method Marker is merely placed on or against the work with the central shaft in the bore of the piece. The end of the marker is then given a sharp blow with a hammer. The type is specially heat-treated to reduce any tendency toward chipping, and so on. Due to the compactness of the assembly, the marker is said to be particularly effective in marking parts requiring several characters in a limited space.



## Grob Improved Files and File Chains

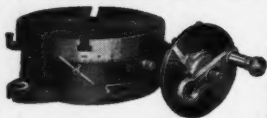
Files and file chains of improved design for use in Grob Continuous Motion Filing Machines are now being manufactured by Grob Brothers, Grafton, Wis. The files are cut at an angle on one end and overlapped in a manner that is said to eliminate chipping or breaking of the file teeth. A section of

### Grob Improved Files and File Chains

the file chain is shown at the left in the illustration showing the method employed to maintain alignment of the files, and, at the right, the files are shown being guided as they pass through the working zone.

In the ends of the files at the back are milled small slots into which projections of the chain links behind the files are snugly fitted. Thus, as the files enter into a straight-line path after leaving the pulley, they are individually

## STEVENS ROTARY TABLES STANDARD AND DIAL TYPES



Write for circular.  
Four sizes, two types of each.

Table graduated for single degree reading. Precision and accuracy. Thirty years' experience designing circular attachments.

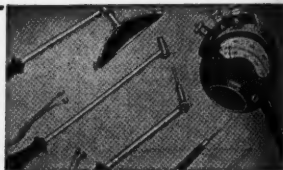
**JOHN B. STEVENS INC.**

306 Hudson St.

New York, N. Y.

**P  
Y  
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O**

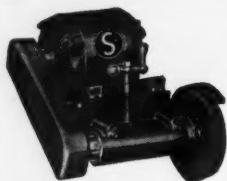
## SURFACE PYROMETER



Ideally suited for any surface or inside temperature readings. A single indicator with four different interchangeable elements. Write for bulletin 120.

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101-105 Lafayette St. New York

## PRECISION GRINDERS!



The STANDARD Type BPA Precision Grinder for external grinding or for wide range internal grinding up to 24" deep.

For Lathe, Planer, Boring Mill, etc.

Sizes:  $\frac{1}{4}$ ,  $\frac{1}{2}$ , 1,  $1\frac{1}{2}$ , 2, 3, 5,  $7\frac{1}{2}$ , 10 H.P.

Ask for Bulletin 162.

Also Portable Drills, Grinders, Blowers, Heavy Duty Grinders, Buffing, Polishing Machines up to 25 H.P.

**THE STANDARD ELECTRICAL TOOL CO.**

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Est. 1912

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**GRAY, Originator of First  
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Most modern Nibbler for Tem-  
plate Cutting, Tool Rooms,  
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Plate Shops.

**GRAY MACHINE CO.**  
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## CAMS

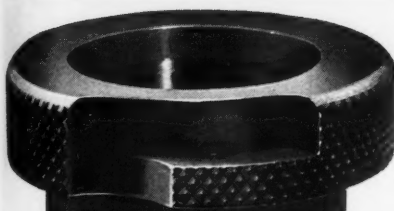
All sizes — shapes

Precision work on  
special machines,  
parts, jigs, tools, etc.

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**RIGHT BUSHING**  
FOR EACH JOB

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**DRILL JIG**  
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**BUSHINGS**

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## The WESSON <sup>all Steel</sup> UNIVERSAL VISE

Gives you faster set-ups and greater accuracy. No more tedious or make-shift measuring. Accurately graduated in all planes. Sturdy cradle design and all-steel construction give greater rigidity; permit faster stock removal. Two sizes, priced for every shop. Also furnished with slotted surface plates.

**Mill Supply Distributors:** Several profitable territories available.

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Please send me Illustrated Folder covering the Wesson Universal Vise.

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Address .....  
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### No. 35 FLYNN



MICROMETER  
OFFSET  
BORING HEAD  
HAS RIGIDITY  
PLUS A  
Large Range  
2" OFFSET

$\frac{3}{4}$ " bar or tool capacity.  
Bores  $\frac{1}{4}$ " to 12" dia. holes.  
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## IN Counting—

The ancient Chinese used an abacus. Today, Durant Productimeters automatically record machine output, running time, idle time, and operating costs. They count strokes, revolutions, lineal units, bottles, cans, packages, and meet every industrial counting or measuring need.

**PRODUCTIMETERS**  
THE SPEEDMETERS OF INDUSTRY  
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173 Eddy Street  
Providence, R. I.

and independently locked into perfect alignment, due to the slots in the files and the projections of the chain link, and the file chain in the working zone is closely guided by the file support guide. Chip clearance is provided by having the file chain guide slightly deeper than the depth of the chain.

## HanDmag Demagnetizer

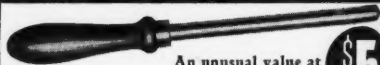
Victor Machinery Company, 134 S. Clinton St., Chicago, Ill., is now marketing an a.c. portable type demagne-



HanDmag Demagnetizer

tizer, to be known as the "HanDmag." The demagnetizer is intended for removing residual magnetism from tools, dies, shear blades, and so on, regardless of size. The manufacturer states

## Diamond Pointed WHEEL DRESSER !



An unusual value at this low price—an efficient tool for dressing all types of general grinding wheels. The diamond is securely held—the tool, No. 3121, is sturdy, 9  $\frac{3}{4}$ " long, with a comfortable handle. Satisfaction fully guaranteed. Send only \$5 to  
**DELTA MFG. CO., 658 E. Vienna Ave., Milwaukee, Wis.**

**\$5**

**5000  
Shapes and Sizes  
Grobet Swiss Files**



Write  
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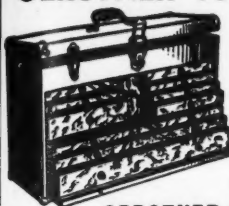
The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss files.

Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability.

Ask also for catalog KM on Files for Filing Machines: catalog KR on Rotary Files and Diesinkers' Burs.

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**Will Please.**  
Machinists and Toolmakers will be delighted with the advanced designs, the finer finish, the better construction. Free catalog shows many sizes and styles.

**GERSTNER TOOL CHESTS**

1240 COLUMBIA ST. DAYTON, OHIO



## SAROSTON Precision Tool Room Grinder

Grinding wheels may be used on either end of spindle.

SIZES UP TO 2 H.P.

**THE SAROSTON CO.**

251 PARK ST., UPPER MONTCLAIR, N. J.

*Grobet*  
**ROTARY FILES**  
Ground from the Solid



*Write*  
**for Catalog KG**

The most complete catalog of its kind, illustrating hundreds of rotary files hand cut, milled cut, ground from the solid; also die-sinkers' burs.

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NEW YORK CITY

TURN THIS RING

FOR THE ADJUSTMENT



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Due to improved manufacturing facilities we are able to materially reduce prices on the "TOLEDO" No. 101 capacity  $\frac{1}{4}$ " to  $\frac{5}{8}$ " and the No. 102 capacity  $\frac{1}{2}$ " to 1" adjustable bolt die stocks.

You will find a "TOLEDO" Adjustable Bolt Die Stock a real time saver and a bargain at the new low prices. Mail the coupon to us today.

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**SPURS WORM-  
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*High precision or commercial production.  
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You can SAFELY entrust your Gear purchases to this exceptionally well equipped and organized plant.

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## Gear Specialties

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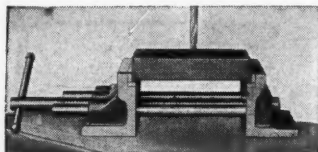
CHICAGO

that any size surface can be demagnetized by passing the Handmag Demagnetizer over the entire area.

The demagnetizer is 4 x 2½ x 2½ in. in size and weighs 2½ lbs. An 8-ft. cord and built-in grip switch are standard equipment.

## National Drilling Vise

A vise with built-in parallel bars which are designed to ensure perfect alignment of work for drilling has been



National Drilling Vise With Built-In  
Parallels

placed on the market by the National Machine Tool Co., 1536 Clark St., Racine, Wis. The parallel bars are said to allow holes to be accurately drilled clear

## HINGES

VARIOUS WIDTHS  
and GAUGES



BUTTS AND  
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## THOR STAMPS

These correctly heated alloy steel stamps give you more marks per dollar.

Central striking point assures even indentation. Thumb side-marking makes them easily read...easily used.

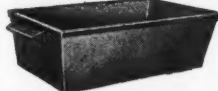
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## The Pittsburgh Stamp Co.

812 CANAL ST. PITTSBURGH, PA.

### New Nesting Type Tote Pans



Lots of 50  
\$1.00 each

20" long x 12" wide x 6½" deep.  
16 ga., drag holes and handles both ends.

Lots of 100 & 200 less 3%; 300 up less 5%

**J. L. LUCAS & SON, INC.**

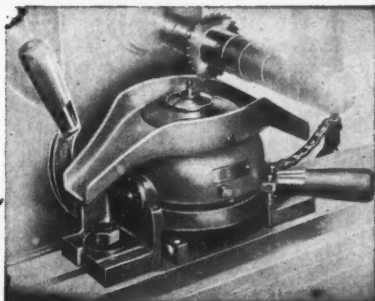
1 Fox Street Bridgeport, Conn.

## CENTERLESS GRINDING

*Accuracy—Prompt Service*

**Commercial Centerless  
Grinding Co.**

6603 Cedar Avenue, Cleveland



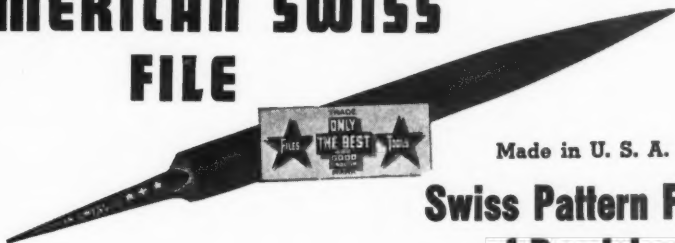
### DEARBORN Automatic Chucking and Indexing Fixture MILLS OVER 1000 PARTS PER HOUR

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

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Made in U. S. A.

### Swiss Pattern Files of Precision

More than **2500** different **SHAPES, CUTS** and **SIZES** to choose from. Used by the most discriminating mechanics.

Repeat orders prove satisfactory performance.

**FASTER CUTTING, UNIFORMITY** in **SHAPE, HARDNESS** and their **LASTING QUALITIES** assure the user of **SATISFACTORY RESULTS** which means a saving in the filing cost.

**AMERICAN SWISS FILE & TOOL CO., ELIZABETH, N. J.**

**LENGTHEN LIFE OF...**

## CENTERLESS GRINDER BLADES



- 10-30 Times Longer Life
- Reduce Replacement Costs
- Do Not Mark or Score Work
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WHEN *Talide Tipped* WITH  
**TUNGSTEN CARBIDE WEAR STRIPS**  
Made in Any Length, Shape or Size

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## STANDS ABUSE

**CARBOLOY**  
  
**DIAMOND DRESSERS**  
For Dressing All Grinding Wheels

Write for Catalog DR-38  
**CARBOLOY COMPANY, INC.**  
11143 E. 8 Mile Road, Detroit, Mich.  
Chic. - Clove. - Newark - Phila. - Pitts. - Worcester, Mass.

through with a 2-in. clearance without any interference from chips or burrs. In addition, the manufacturer states that the vise can be used on all three sides, thereby saving time and reducing costs on all drilling operations. The vise may be employed for drilling round as well as square work.

## Elk Universal Toolholder

Elk Tools, Inc., 33-35 W. 60th St., New York, N.Y., has brought out a toolholder designed to hold a tool bit in



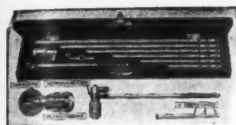
Elk Universal  
Toolholder

either direction as required for right or left hand facing, turning, or threading, as well as for boring or cutting off, thus eliminating the need for a number of different toolholders with which to perform these various operations.

The shank of the holder is of the usual toolholder design but the head is square with two tool bit openings, making it possible to set a tool bit at a 45 deg. angle with the shank in either direction. The head carries four knurled screws, the larger one serving to clamp the tool bit. The design is such that thrust of the tool against the work tightens the grip. This design is said to make it possible to insert or remove bits in minimum time; also to eliminate chatter on heavy cuts. The smaller screws control a separate adjustment by means of which the cut-



**NEW International INSIDE MICROMETER**  
Nice Workmanship, Highest Accuracy



$\frac{1}{4}$ "-2 $\frac{3}{8}$ " range—nicely made.  
\$3.90.

1 $\frac{1}{2}$ "-12", 1 $\frac{1}{2}$ "-6"  
in polished hard-  
wood case.

Workmanship and  
accuracy uncondi-  
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Telescope Gauges  
Set of 3—only

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**Accurate Hole Transfer Made Easy With  
NIELSEN TRANSFER SCREWS**



Simply insert in holes,  
invert, strike sharply and  
you have centers and  
drill circles perfectly lo-  
cated. Reduce time and  
eliminate spoilage of other  
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**CONTINUOUS HINGES**



Manufactured by  
**AUTO MOULDING  
& MFG. CO.**

2326 S. CANAL ST. CHICAGO

**WRITE FOR STOCK LIST**

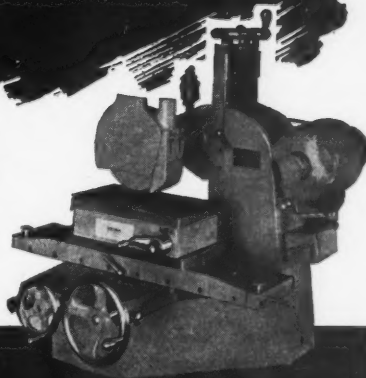
**BERGRAM PRESENTS**

**A NEW SURFACE GRINDER**

This bench type surface grinder (Type S-1) has a  
permanent magnetic chuck with grinding surface  
5" x 10"—no wires or generators. Electro-magnetic  
chucks can be furnished.

Interchangeable pulleys compensate for wheel wear.  
An adaptor is furnished for mounting small wheels  
for groove grinding.

**WRITE FOR COMPLETE DETAILS.**



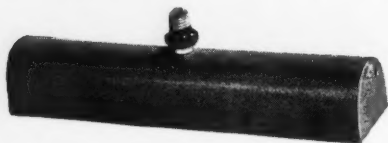
**Bergram Mechanical Engr. Co., Inc.**  
23 WHITING ST. NEW BRITAIN, CONN.

ting edge can be set with micrometer accuracy at the correct cutting point.

The holder is of drop forged alloy steel, heated treated, and is made in four sizes; No. 0, for  $\frac{1}{16}$  x 4-in. tool bits, No. 1, for  $\frac{3}{16}$  x 5-in. bits, No. 2, for  $\frac{1}{2}$  x 5-in. bits, and No. 3, for  $\frac{1}{2}$  x 5-in. bits.

### Van Dyke Screw-In-Socket Fluorescent Lamp No. 3001

Van Dyke Industries, 2900 S. Halsted St., Chicago, Ill., is now manufacturing



Van Dyke Screw-In-Socket Fluorescent Lamp No. 3001

a self-contained, screw-in-socket fluorescent lamp to be known as the No. 3001. According to the manufacturer, this

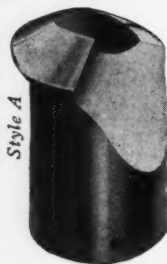
lamp can be screwed into the socket of a pendant or side light as simply as an electric light bulb. The lamp is made in various lengths and in single and double tube. Available for a.c. only.

### Atlantic Type AK Abrasive Wheel

The Atlantic Abrasive Corp., 520 Pearl St., South Braintree, Mass., is now marketing an abrasive wheel especially designed for grinding welds and snagging castings. This wheel, designated as the Atlantic Type AK, makes use of a patented synthetic bonding material which is said to permit the wheel to be operated at a maximum working speed and pressure without danger of burning work.

### Holophane "Cranelite"

To meet the demand for a crane light designed to withstand vibration and "whip" and to provide extra illumination under cranes, the Holophane Co., 342 Madison Ave., New York, N. Y.



Style A

Plain Boring

### BOKUM Long Life Boring, Bottoming and Internal Threading Tools

... for holes from 3/32" up. Three types... twelve sizes. Real money savers for lathe, jig borer, screw machine or boring mill.

Write for bulletin and price list.

### BOKUM TOOL CO., INC.

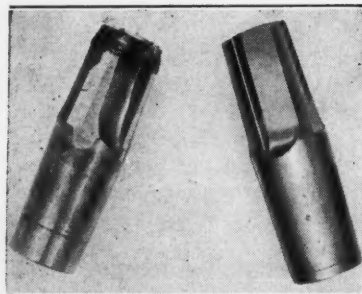
49 W. Hancock St.

Detroit, Mich.



Style C

Internal Threading



### DON'T THROW AWAY VALUABLE CARBIDE TIPPED TOOLS \$\$\$

- Write at once for our folder on **CARBIDE TOOL SALVAGE.**

Tips Remounted — Shanks Retipped — Round Tools Expanded to Size — Grinding — Lapping

Carbide Tool Salvage Division

**SUPER TOOL COMPANY**

21650 Hoover Rd.

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For the **HARD** jobs---

# STOW FLEXIBLE SHAFT MACHINES



**STOW** has been making flexible shafts longer than anyone. Started way back in 1875—by inventing the flexible shaft for power transmission. Ever since, Stow has been meeting new requirements and making satisfactory applications by the thousands.

Remember, the **SHAFT** is the prime element in what a Flexible Shaft Machine can do. There's a machine for every kind of use, too—some uses, perhaps you've never thought of. So send for catalog and see how Stow can help you do better work, quicker—at a big saving. Write today.

# STOW

MFG. CO., INC.

1 SHEAR ST., BINGHAMTON, N. Y.

**HOW** can you know about the ability of this or that machine to do your kind of work?

**HOW** about relying on that time-tested measure—experience?

NO TANG • NO TAPER  
REQUIRED ON DRILLS  
IN THE NEW UNIVERSAL  
ADJUSTABLE DEPTH

## Collet Chucks



# UNIVERSAL

Engineering Company  
Frankenmuth, Mich.

has placed on the market the "Cranelite" shown herewith. This light, according to the manufacturer, is made to withstand the severe service of under-crane mounting, and, in actual service on a high speed crane, the bulb of the unit is said to last its normal life.

The Cranelite is designed for installation under the catwalk and can be relamped by raising up a section of the catwalk floor, or it can be mounted on the edge of the catwalk and swung up for relamping by using an angle section for attachment to the catwalk. The light is fastened to the crane by means

of a 10-in. diameter, 1/2-in. thick steel plate. The weight of the unit is suspended from this plate by three compound double-acting steel springs 80



Holophane "Cranelite"



PRESSES  
FEEDS  
AUTOMATIC  
EQUIPMENT

**THE V&O Press Co., Inc.**  
HUDSON N. Y.

that in case of failure of any or all of the springs, the unit will not fall. The springs are said to absorb shock up and down and in any lateral direction, thereby effectively eliminating shock and whip. All nuts are held in place by means of cotter pins.

### New Literature

**OTC Puller Bulletin.** A bulletin illustrating and describing the complete line of Gripomatic Pullers and Attachments has been issued by the manufacturer—the Owatonna Tool Co., 357 Cedar St. Owatonna, Minn. The bulletin gives full data on these pullers which makes it possible for a maintenance man to select exactly the puller needed for his requirements. Capacity, depth of reach, pulling power, and other interesting facts are given, together with actual illustrations showing the tools in use.

The bulletin is available free of charge and will be sent without obligation.

**"Titan" Electric Hoist,** product of the Detroit Hoist & Machine Co., 8201 Morrow St., Detroit, Mich., is the subject of a descriptive, illustrated, four-page bulletin released by this firm. Copy of Bulletin 801 free upon request.

**KOEBELITE  
DIAMOND TOOLS**

★

Deliver a Known  
Quantity—and Quality  
—of Service

★

**KOEBEL DIAMOND  
TOOL COMPANY**  
DETROIT

# THREADWELL

# TAPS

Here are three reasons why you get long life, accuracy and dependability from **THREADWELL TAPS**:

1. Careful selection of materials.
2. Close study of modern heat treating.
3. Rigid inspection of each tap before it leaves the plant.

Try **THREADWELL TAPS** on your tough, hard, long tapping jobs.

**THREADWELL TAP & DIE CO.**

GREENFIELD

MASS.



Send for Catalog  
No. 10 describing  
the complete  
Threadwell line.



## REMOVE HARDENING SCALE WITH LEIMAN BROS. **Continuous Feed** (PATENTED) **SAND BLAST OUTFIT**

It furnishes a modern, cleanly way of cleaning moulding sand from patterns and castings. Letters and designs stenciled. Will replace the scratch brush for mat finishing and similar effects on all classes of goods—it will replace the use of disagreeable acids for this work.

Finishes may be fine, medium or coarse on all materials as desired—but, most important, it will always be uniform—no streaky, uneven results.

Any article to be plated should be sand blasted first—it will result in a more permanent plate, a quicker plate, and a saving of time in plating and a saving of current.

The most inexperienced person can operate it without instructions—the work cannot be spoiled.

Metal goods of every kind and description should be sand blasted to increase plating durability.

The sand blasting process makes a surface to which electro plate will adhere more securely and much more rapidly and so sand blasting saves time in plating, and improves your finish. This also applies to articles to be painted, sprayed, enameled or otherwise treated. Mat finishes of various degrees are quickly secured.

**LEIMAN BROS., Inc.** 4W-23 WALKER ST.  
NEW YORK CITY  
MAKERS OF GOOD MACHINERY FOR 50 YEARS

**Ohio Units Cam Grinding Equipment** for production grinding of out-of-round shapes to precision limits is the subject of an illustrated 12-page catalog now being issued by the Ohio Units Manufacturers, Dayton, Ohio. Copy free upon request.

**"Grinding and Finishing with Portable Equipment."** This 24-page booklet, publication of the Norton Company, Worcester, Mass., illustrates and describes the use of portable grinders and sanders in the foundry cleaning room,

steel mill, railroad and car shops, stone industry, toolroom and die shop, and for grinding and finishing welds. Copy free upon request.

**"Vim" Leather Packings** for hydraulic and pneumatic use are the subject of a 24-page illustrated booklet issued by E. F. Houghton & Co., Third and Somerset Sts., Philadelphia, Pa. The application, impregnating, moulding, and tanning of Vim leather packings are discussed in detail. Copy free upon request.

## What are your Pump Requirements?

### -Tell us your needs!

- We can furnish **Stock Pumps** in a wide variety of types and sizes—Geared—Vane—Centrifugal.
- Also—**Special Pumps** made to your order.

Write—Brown & Sharpe Mfg. Co.  
Providence, R. I., U. S. A.

**BROWN & SHARPE**  
PUMPS

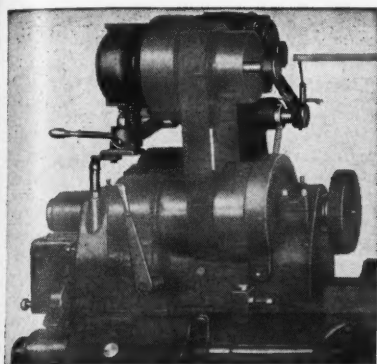


**Weldon Tools Catalog No. 8.** An 80-page catalog listing the complete line of tools manufactured by The Weldon Tool Co., Cleveland, Ohio, is now being published by this firm. Designated as the No. 8, the catalog illustrates and describes various types of Weldon straight shank, single and double-end end mills, tapered shank end mills, jig borer end mills, shell end mills, circular cut-off tools, cut-off blades, die sinking cutters. T-slot cutters, holders for shell and jig borer end mills, toolroom and jig borer end mill sets, and so on.

In addition, the catalog contains a section devoted to illustrating and describing Weldon special tools. Also included are tables of hardness conversion, decimal equivalents, and approximate speeds for end mills.

Copy of Catalog No. 8 will be sent free to any mechanical executive who requests it on his company letterhead.





## Modernize Your Machines With Cullman Drives

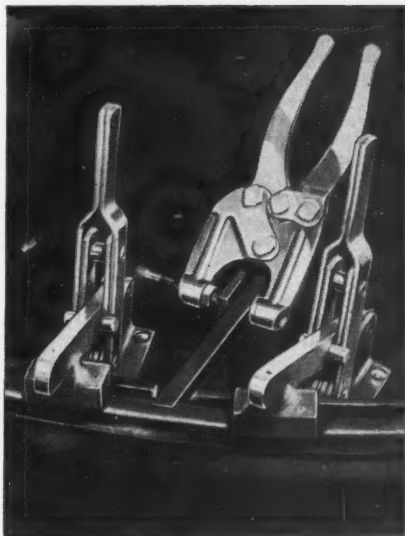
Your Lathes, Shapers, Milling Machines and other belt driven machines can now be easily motorized with direct drives.

Cullman Drives are rigidly constructed, easily installed and simple to operate.

Made for motors from  $\frac{1}{4}$  to 15 H.P.

SEND FOR INFORMATION

**CULLMAN WHEEL CO.**  
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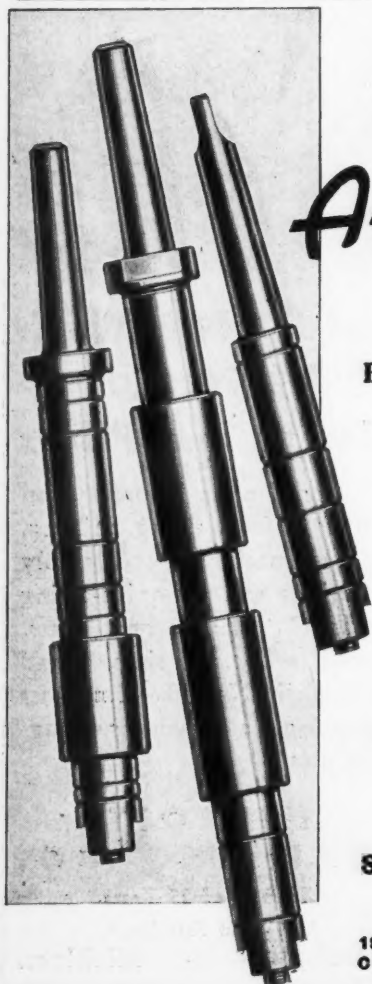
Nicholson Control Valves Catalog No.

140. W. H. Nicholson & Co., 136 Oregon St., Wilkes-Barre, Pa., is now issuing a 14-page catalog describing "Nicholson" Lever, Foot, Solenoid, and Motor-Operated 3 and 4-Way Valves for use in operating air, water, steam, and oil, single and double-acting cylinders. Copy free upon request.

**Wilson Arc Welding Electrodes.** This 24-page bulletin, publication of the Wilson Welder and Metals Co., 60 E. 42nd St., New York, N. Y., has been prepared as a useful guide in making quick, sure selections of proper electrodes for all classifications of welding work.

The bulletin reviews the general description, application, procedure for use, and physical properties of Wilson electrodes for numerous and varied welding purposes. Discussed in turn are the flat, vertical, or over-welding of mild steel; single and multiple pass all-position welding of mild steel; horizontal fillet and butt welding of mild steel; high-quality, high-speed, deep-groove welding of mild steel; general purpose, all-position welding with a.c. transformers; all position welding of carbon molybdenum and low alloy high-tensile steels and all-position welding of cast iron. Suggestions regarding the selection of proper electrodes for other types of welding are also offered.

The final section of the bulletin is devoted to welding symbols and instructions for their use as published by



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American Welding Society. Copy of Bulletin No. ADW-18 free upon request.

## State University of Iowa Announces 1940 Summer Management Course Devoted to Motion and Time Study

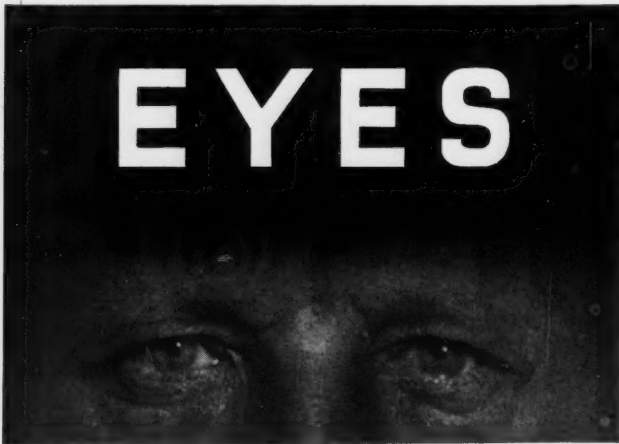
To be held in Iowa City, Iowa, from June 10 to June 29, 1940, the University of Iowa is offering a special three-week

course for plant managers, foremen, industrial engineers, cost accountants, and other industrial executives who may be interested in comprehensive training in motion and time study, waste elimination, cost reduction, and related subjects. The course was offered for the first time last year and was attended by executives and engineers from 25 different industries in the United States and Canada.

The Summer Management Course will be under the direction of Ralph M. Barnes, Professor of Industrial Engineering, College of Engineering, University of Iowa. Assisting in the course will be seven university instructors and lecturers and eight visiting managers and engineers from industry who will conduct forums on practical production problems.

Lectures will cover subjects of Labor's Attitude Toward Cost Reduction Work, Use of Tests in Employment Procedures, Federal Government and Labor Law, Motion Study in the Field of Distribution, Motion Study Application in the Commercial Laundry, Methods of Production Control, Cost Reduction Through Better Design of Product, More Effective Utilization of Materials, and Improved Manufacturing Methods, and similar subjects.

The University of Iowa is well known for its instruction in industrial engineering and the results of research in this field carried on in its laboratories are receiving attention from manufacturers.



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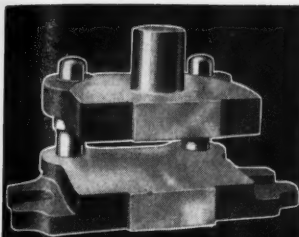


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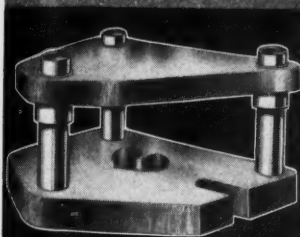


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# Production and Machine Tool Show

to be held at the Public Auditorium,  
Cleveland, Ohio

June 25th to 29th, Inclusive

**S**PONSORED by a group of production equipment manufacturers and under the management of Richard C. Bonner, Grafton, Wisconsin, a Production and Machine Tool Show will be held at the Public Auditorium, Cleveland, Ohio, June 25 to 29, 1940. American manufacturers of machines, tools, accessories, parts, and materials have been invited to participate, and the space reserved thus far indicates that the show will receive the support of a large part of the metal working industry.

Cleveland is the logical location for such an exhibition, due to the fact that it is situated in the approximate center of the principal industrial area of the nation. An added attraction consists in that Cleveland has unexcelled facilities for such a show, the Public Auditorium alone having approximately 150,000 square feet of space available for exhibition purposes. The building is also wired for power, so that machines can be demonstrated in actual production.

This show will provide an opportunity for manufacturers of metal working equipment and tools to acquaint the users of such equipment with the improvements that have been made in design and quality in the past few years. A general invitation to attend has been broadcast to machine shop executives.



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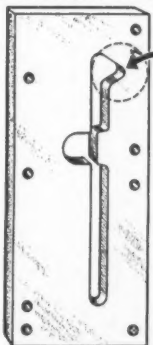
was used to grind and fit this triangular section about 5/8" deep, with a radius of 1/8". The result was a saving of 12 or more hours.

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# FOR YOUR CATALOG LIBRARY

*To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.*

## 1. Taps

Threadwell Tap & Die Co., Greenfield, Mass., has just issued new bulletin detailing and listing prices on Threadwell Taps, including hand machine screw, taper pipe, straight pipe and inserted chaser pipe taps.

## 2. Bench Lathes

New 16-page catalog featuring bench lathes and other shop tools has been issued by Clausing Manufacturing Co., Inc., Ottumwa, Iowa.

## 3. Salt Tablets

Fairway Laboratories, Inc., 1532 N. Hadley St., St. Louis, Mo., has available two informative booklets, "Keep Your Workers on Their Feet" and "Are Your Workers Worth Their Salt?" These treatises deal with the use of salt tablets in the prevention and treatment of heat sickness.

## 4. Shears

The Cincinnati line of All-Steel Shears is illustrated and described in new 28-page catalog issued by The Cincinnati Shaper Co., Cincinnati, Ohio.

## 5. Unisorb in the Industrial Plant

New 24-page book issued by The Felters Company, Inc., 210 South St., Dept. L5, Boston, Mass., explains the details of simplified machine installation, lower maintenance costs, and vibration and noise control by means of Unisorb Felt.

## 6. Immersion Pyrometer

Catalog No. 110 issued by The Pyrometer Instrument Co., 103-105 Lafayette St., New York, N. Y., features the Pyro Improved Immersion Pyrometer.

## 7. Universal Fixture

Features and advantages of the Ex-Cell-O Universal Fixture for handling of boring, turning and facing short-run jobs are illustrated and described in Bulletin No. 12691. Ex-Cell-O Corporation, 1206 Oakman Blvd., Detroit, Mich.

## 8. Machinists' Practical Guide

This guide includes 52 pages of decimal equivalents, cutting speeds, lubricants recommended, and hundreds of other useful hints. Morse Twist Drill and Machine Co., New Bedford, Mass.

## 9. Automatic Dies and Taps

National Acme pneumatic taps and dies are illustrated and described in 64-page catalog D-38. The National Acme Company, 170 E. 131st St., Cleveland, Ohio.

## 10. Bronze Bearings

Johnson Bronze Co., 590 Mill St., New Castle, Pa., has available 72-page catalog listing and describing Johnson bronze bearing service.

## 11. Hydraulic Cylinders

Hanna hydraulic cylinders are fully dimensioned in Catalog 229. Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.

## 12. Control Valves

Flat disc type control valves for operating single and double acting air, steam, water or oil cylinders are illustrated and described in 14-page bulletin issued by W. H. Nicholson & Co., 136 Oregon St., Wilkes-Barre, Pa.

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18. **Electric Hoist**

Bulletin 801 details the small Titan electric hoist. Detroit Hoist & Machine Co., Detroit, Mich.

18. **Sine Angle Plate**

The Kar Engineering Company, Inc., 200 Hudson St., New York City, has available folder illustrating and describing the new and improved sine angle plate.

18. **Flexible Shaft Equipment**

More than 25 different types of Haskins flexible shaft equipment and many diverse applications are illustrated and described in booklet available from R. G. Haskins Company, 619 S. California Ave., Chicago, Ill.

18. **Radial Drill**

Bulletin No. 325, issued by The American Tool Works Co., Cincinnati, Ohio, details the new American 32-Speed Hole Wizard Radial Drill.

18. **Resinoid Bonded Wheels**

New folder detailing Bay State Resinoid Bonded wheels has been issued by Bay State Abrasive Products Co., Westboro, Mass.

18. **Socket Screws**

Bulletin 83-8P outlines the details on Bristol Socket Screws. The Bristol Co., Mill Supplies Div., Waterbury, Connecticut.

19. **Rotary Files**

Rotary Files and Diesinkers' Burs are illustrated and described in Catalog KG available from Grobet File Corp. of America, 3 Park Place, New York, N. Y.

20. **Speed Vise**

New bulletin 21-S illustrates and describes the Greene Speed Vise in 3-in., 4-in. and 6-in. sizes. Cardinal Machine Co., Inc., Glendale, Calif.

21. **Machine Tool Motor Drive**

A complete line of transmissions for motorizing all types of machine tools is illustrated and described in bulletin released by Western Manufacturing Company, 3428 Scotten Ave., Detroit, Mich.

22. **Milling Attachments**

Fray All Angle Milling Attachments are illustrated and described in bulletin available from Fray Machine Tool Co., Glendale, Calif.

23. **Tool Cases and Chests**

Fourteen types of tool cases and chests for tool makers and machinists are illustrated and described in bulletin available from H. Gerstner & Sons, 1240 Columbia St., Dayton, Ohio.

24. **Cut-Off Machine**

New, improved Delta Cut-Off Machine is illustrated and described in new bulletin available from Delta Mfg. Co., 634 E. Vienna Ave., Milwaukee, Wisconsin.

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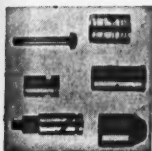
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**MODERN MACHINE SHOP • 431 MAIN STREET  
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**Procedure Handbook of Arc Welding Design and Practice.** Sixth Edition. Published by The Lincoln Electric Co., Cleveland, Ohio. Semi-flexible imitation leather covers. 1,125 pages, 5 $\frac{1}{4}$  x 9 in.. 1,557 illustrations. Price, \$1.50.

This edition contains the results of two years of fact-finding by a staff of 200 arc welding application engineers who contacted every industry throughout the world. Encyclopedic in scope, concisely written, and profusely illustrated, the handbook is a complete arc welding reference guide. It contains a wealth of information of interest to engineers, designers, architects, production managers, welding supervisors, draftsmen, steel fabricators and erectors, foremen, cost estimators, maintenance

managers, shipbuilders, piping and pipe-line contractors, job welders, welderies, and repair shops, as well as students of welding. With this handbook, individuals who design for welding, manufacture, or build by welding may keep abreast of the fast-growing field of welding development.

The book is divided into eight sections, covering the following subjects: Welding Methods and Equipment; Technique of Welding; Procedures, Speeds, and Costs for Welding Mild Steel; Structure and Properties of Weld Metal; Weldability of Metals; Designing for Arc Welded Steel Construction of Machinery; Designing for Arc Welded Structures, and Typical Applications of Arc Welding in Manufacturing, Construction, and Maintenance.



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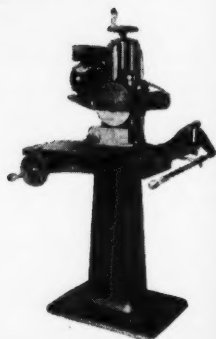
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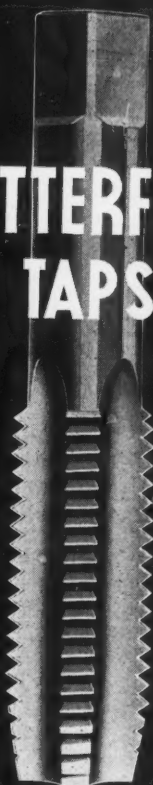
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